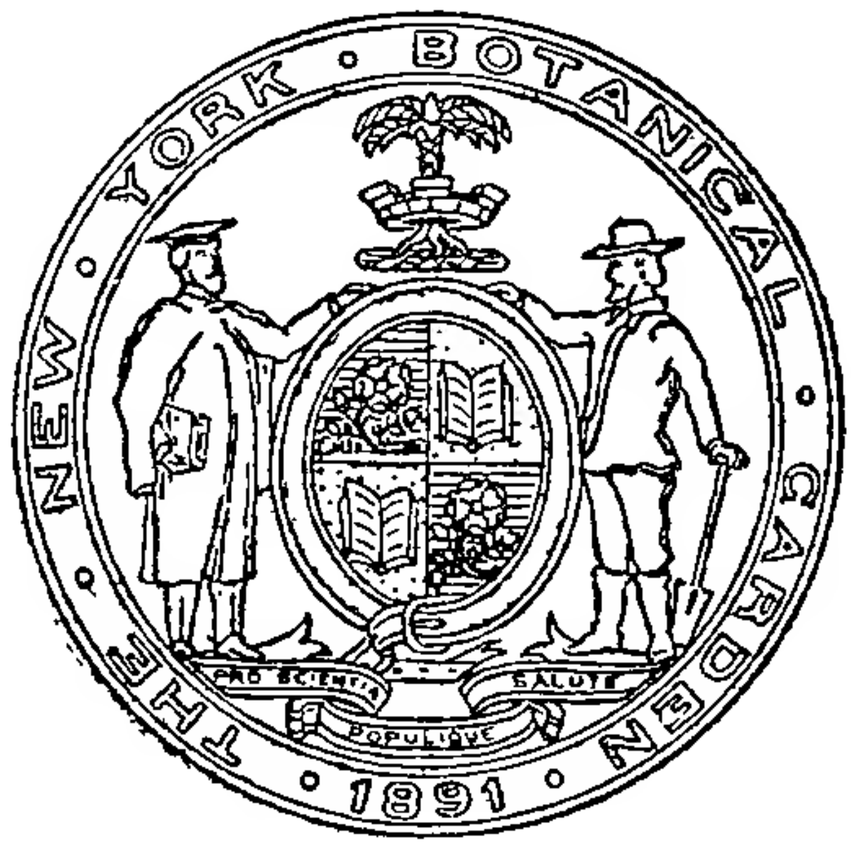
BULLETIN

OF

The New York Botanical Garden



VOLUME I

WITH 12 PLATES AND TWO MAPS

1896–1900

PUBLISHED FOR THE GARDEN
AT 41 NORTH QUEEN STREET, LANCASTER, PA.
BY THE NEW ERA PRINTING COMPANY

PRESS OF
THE NEW ERA PRINTING COMPANY,
LANCASTER, PA.

OFFICERS, 1901.

PRESIDENT—D. O. MILLS,
VICE-PRESIDENT—ANDREW CARNEGIE,
TREASURER—CHARLES F. COX,
SECRETARY—N. L. BRITTON.

BOARD OF MANAGERS.

1. ELECTED MANAGERS.

ANDREW CARNEGIE,
CHARLES F. COX,
W. BAYARD CUTTING,
WILLIAM E. DODGE,
JOHN I. KANE,
D. O. MILLS,
J. PIERPONT MORGAN,
GEORGE W. PERKINS,
JAMES A. SCRYMSER,
SAMUEL SLOAN,
W. GILMAN THOMPSON,
SAMUEL THORNE.

2. EX-OFFICIO MANAGERS.

THE PRESIDENT OF THE DEPARTMENT OF PUBLIC PARKS,
HON. GEO. C. CLAUSEN
THE MAYOR OF THE CITY OF NEW YORK,
HON. R. A. VAN WYCK.

3. SCIENTIFIC DIRECTORS.

HON. SETH LOW, CHAIRMAN.

HON. ADDISON BROWN,
PROF. C. F. CHANDLER,
PROF. J. F. KEMP,
HON. MILES O'BRIEN,
PROF. H. H. RUSBY,
PROF. L. M. UNDERWOOD.

GARDEN STAFF.

DR. N. L. BRITTON, *Director-in-Chief.*
DR. D. T. MACDOUGAL, *First Assistant.*
DR. JOHN K. SMALL, *Curator of the Museums.*
DR. P. A. RYDBERG, *Assistant Curator.*
GEORGE V. NASH, *Head Gardener.*
ANNA MURRAY VAIL, *Librarian.*
DR. H. H. RUSBY, *Curator of the Economic Collections.*
COL. F. A. SCHILLING, *Superintendent.*
JOHN R. BRINLEY, *Landscape Engineer.*
WALTER S. GROESBECK, *Clerk and Accountant.*
CORNELIUS VAN BRUNT, *Honorary Floral Photographer.*

Members of the Corporation.

DR. TIMOTHY F. ALLEN,
PROF. N. L. BRITTON,
HON. ADDISON BROWN,
WM. L. BROWN,
ANDREW CARNEGIE,
PROF. CHAS. F. CHANDLER,
WM. G. CHOATE,
HON. EDWARD COOPER,
CHAS. F. COX,
JOHN J. CROOKE,
W. BAYARD CUTTING,
ROBERT W. DE FOREST,
WM. E. DODGE,
DR. WM. H. DRAPER,
PROF. SAM'L W. FAIRCHILD,
GEN. LOUIS FITZGERALD,
RICHARD W. GILDER,
HON. THOMAS F. GILROY,
PARKE GODWIN,
HON. HUGH J. GRANT,
HENRY P. HOYT,
ADRIAN ISELIN, JR.,
MORRIS K. JESUP,
JOHN I. KANE,
EUGENE KELLY, JR.,
PROF. JAMES F. KEMP,
JOHN S. KENNEDY,
HON. SETH LOW,
DAVID LYDIG,
EDGAR L. MARSTON,
D. O. MILLS,
J. PIERPONT MORGAN,
THEO. W. MYERS,
HON. MILES O'BRIEN,
GEO. M. OLCOTT,
PROF. HENRY F. OSBORN,
GEORGE W. PERKINS,
JAMES R. PITCHER,
RT. REV. HENRY C. POTTER,
PERCY R. PYNE,
JOHN D. ROCKEFELLER,
WM. ROCKEFELLER,
PROF. H. H. RUSBY,
WM. C. SCHERMERHORN,
JAMES A. SCRYMSER,
HENRY A. SIEBRECHT,
SAMUEL SLOAN,
WM. D. SLOANE,
NELSON SMITH,
DR. W. GILMAN THOMPSON,
LOUIS C. TIFFANY,
SAMUEL THORNE,
PROF. L. M. UNDERWOOD,
WILLIAM H. S. WOOD.

TABLE OF CONTENTS.

No. 1. April 15, 1896.

PAGE.

Act of Incorporation..... 1
Members of the Corporation..... 5
Officers and Managers, 1896 6
Provisions for Patrons, Fellows and Annual Members..... 7
List of Patrons..... 8
Constitution and By-Laws..... 8
Report of the Secretary for 1895..... 10
Report of the Treasurer for 1895..... 18
Agreement with Columbia University..... 19
Recent Progress..... 20

OUTLINE MAP OF THE SITE.

No. 2. January 1, 1897.

Report of the Plans Commission, accepted December 12, 1896.. 23
Report of the Committee on Plans, accepted December 12, 1896. 47
General Plan for the Arrangement of the Museums, adopted June 9, 1896..... 50
Provisional Regulations for the Office of Director-in-Chief, adopted June 17, 1896..... 52
Amendment to the Act of Incorporation..... 54
List of Annual Members to December 12, 1896..... 56
Address on Botanical Gardens..... 62
The Diversion of the Bronx River from its old Channel..... 78

GENERAL PLAN OF THE GROUNDS.

No. 3. February 15, 1898.

Report of the Committee on Plans, submitted and accepted January 10, 1898..... 87
Report of the Committee on Patrons, Fellows and Annual Members, submitted and accepted January 10, 1898..... 98
List of Annual Members, January 10, 1898..... 98
Report of the Secretary and Director-in-Chief for 1896..... 106
Report of the Secretary and Director-in-Chief for 1897..... 122

List of Plants in Grounds and Temporary Greenhouse, 1897... 137
Condensed Financial Statement, June 20, 1895, to January 10, 1898..... 162
Description of the Range of Horticultural Houses, with Illustration..... 164
Description of the Museum Building, with Illustration..... 167
Map of Bronx Park, showing Botanical Garden Grounds and Site appropriated for the New York Zoölogical Park

No. 4. April 13, 1899.

Report of the Secretary and Director-in-Chief for 1898..... 171
Appendix 1. Accessions of Material..... 185
Appendix 2. Schedule of Expenditures during 1898 under Appropriations made by the Board of Managers..... 193
Appendix 3. Lists of Plants in the Grounds, 1898..... 195
Report of the Committee on Patrons, Fellows and Annual Members, submitted January 9, 1899, including List of Annual Members..... 243
Report of the Honorary Curator of the Economic Collections to the Board of Scientific Directors..... 252
Botanical Contributions:
Description of a new Stonecrop from Mexico, by N. L. Britton..... 257
The Cespitose Willows of Arctic America and the Rocky Mountains, by P. A. Rydberg..... 257
Undescribed Plants of the Southern United States, by John K. Small 278
New Grasses from the Southern United States, by Geo. V. Nash..... 290
Reproduction of Photographs taken within the Grounds, Plates 3–8

No. 5. March 30, 1900.

Report of the Secretary and Director-in-Chief for 1899 (with Plate 9)..... 295
Report of the Curator of the Museums..... 311
Report of the Honorary Curator of the Economic Collections. 322
Report of the Acting Librarian..... 325
Report of the Director of the Laboratories..... 331
Report of the Head Gardener..... 334

Report of the General Assistant on the Plantations..... 337
Schedule of Expenditures during 1899..... 397
Report of the Committee on Patrons, Fellows and Members... 401
Report of the Treasurer..... 412
Report of the Scientific Directors..... 414
Botanical Contributions:
The Roots and Mycorhizas of some of the Monotropaceæ, by D. T. MacDougal and Francis E. Lloyd (Plates 10, 11, 12)..... 419
Some new Grasses from the Southern States, by Geo. V. Nash..... 429
A new *Trisetum* from Michigan, by Geo. V. Nash..... 437
The Genus *Bumelia* in North America, by John K. Small.. 437
Descriptions of new North American Thorns, by N. L. Britton..... 447

PUBLICATIONS

OF

The New York Botanical Garden

Journal of the New York Botanical Garden, monthly, illustrated, containing notes, news and non-technical articles of general interest. Free to all members of the Garden. To others, 10 cents a copy; $1.00 a year. [Not offered in exchange.] Vol. I, 1900, viii + 213 pp., 5 plates, and 25 figures in text.

Bulletin of the New York Botanical Garden, containing the annual reports of the Director-in-Chief and other official documents, and technical articles embodying the results of investigations carried out in the Garden. Vol. I, x+464 pp., 3 maps, and 12 plates, 1896–1900. $3.00. Current numbers free to all members of the Garden; to others, 50 cents a copy.

Memoirs of the New York Botanical Garden, Vol. 1. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Dr. Per Axel Rydberg, assistant curator of the museums. An arrangement and critical discussion of the Pteridophytes and Phanerogams of the region with notes from the author's field book and including descriptions of 163 new species. ix + 492 pp. Roy. 8vo, with detailed map. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each.

No. 1. Symbiosis and Saprophytism, by Dr. D. T. MacDougal.

No. 2. New Species from western United States, by Dr. Per Axel Rydberg.

No. 3. The dichotomous *Panicums*: some new Species, by Geo. V. Nash.

No. 4. *Delphinium Carolinianum* and related Species, by Dr. Per Axel Rydberg.

No. 5. Studies on the Rocky Mountain Flora—I, by Dr. Per Axel Rydberg.

No. 6. Notes and Descriptions of North American Plants I and II, by Dr. J. K. Small.

No. 7. Vegetative Reproduction and Multiplication in *Erythronium*, by Frederick H. Blodgett.

No. 8. Two new Species of *Grimmia* from Montana, by R. S. Williams.

No. 9. Studies on the Rocky Mountain Flora—II, by Dr. Per Axel Rydberg.

No. 10. " " " " " " —III, by Dr. Per Axel Rydberg.

All subscriptions and remittances should be sent to

NEW YORK BOTANICAL GARDEN

BRONX PARK, NEW YORK CITY

VOL. I. NO. 1.

BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN.

CONTENTS:

ACT OF INCORPORATION, 1
MEMBERS OF THE CORPORATION, ... 5
OFFICERS AND MANAGERS, 1896, . 6
PROVISIONS FOR PATRONS, FELLOWS AND ANNUAL MEMBERS, . . 7
LIST OF PATRONS, ... 8
CONSTITUTION AND BY-LAWS, ... 8
REPORT OF THE SECRETARY FOR 1895, ... 10
REPORT OF THE TREASURER FOR 1895, ... 18
AGREEMENT WITH COLUMBIA UNIVERSITY, ... 19
RECENT PROGRESS, ... 20
OUTLINE MAP OF THE SITE.

[ISSUED, APRIL 15, 1896.]

OFFICERS, 1896.

PRESIDENT—CORNELIUS VANDERBILT,
VICE-PRESIDENT—ANDREW CARNEGIE,
TREASURER—J. PIERPONT MORGAN,
SECRETARY—N. L. BRITTON.

BOARD OF MANAGERS.

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D. O. MILLS,
J. PIERPONT MORGAN,
JAMES A. SCRYMSER,
SAMUEL SLOAN,
CORNELIUS VANDERBILT.

2. EX-OFFICIO MANAGERS.

HON. S. V. R. CRUGER,
THE PRESIDENT OF THE DEPARTMENT OF PUBLIC PARKS.

HON. WM. L. STRONG,
THE MAYOR OF THE CITY OF NEW YORK.

3. SCIENTIFIC DIRECTORS.

SETH LOW, CHAIRMAN.

N. L. BRITTON,
ADDISON BROWN,
C. F. CHANDLER,
J. F. KEMP,
ROBERT MACLAY,
W. GILMAN THOMPSON.

BULLETIN

OF

The New York Botanical Garden

Vol. I. APRIL 15, 1896. No. I.

ACT OF INCORPORATION,

As amended by Chapter 103 of the Laws of 1894, approved March 7, 1894.

(Amendments of 1894 printed in italics.)

Chapter 285.

AN ACT to provide for the establishment of a botanic garden and museum and arboretum, in Bronx Park, in the City of New York, and to incorporate The New York Botanical Garden for carrying on the same.

Approved by the Governor April 28, 1891. Passed, three-fifths being present.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

SECTION 1. Seth Low, Charles P. Daly, John S. Newberry, Charles A. Dana, Addison Brown, Parke Godwin, Henry C. Potter, Charles Butler, Hugh J. Grant, Edward Cooper, Cornelius Vanderbilt, Nathaniel L. Britton, Morris K. Jesup, J. Pierpont Morgan, Andrew Carnegie, Thomas F. Gilroy, Eugene Kelly, Jr., Richard T. Auchmuty, D. O. Mills, Charles F. Chandler, Louis Fitzgerald, Theodore W. Myers, William C. Schermerhorn, Oswald Ottendorfer, Albert

Gallup, Timothy F. Allen, Henry R. Hoyt, William G. Choate, William H. Draper, John S. Kennedy, Jesse Seligman, William L. Brown, David Lydig, William E. Dodge, James A. Scrymser, Samuel Sloan, William H. Robertson, Stephen P. Nash, Richard W. Gilder, Thomas Hogg, Nelson Smith, Samuel W. Fairchild, Robert Maclay, William H. S. Wood, George M. Olcut, Charles F. Cox, James R. Pitcher, Percy R. Pyne and such persons as are now, or may hereafter be associated with them, and their successors, are hereby constituted and created a body corporate by the name of The New York Botanical Garden, to be located in the City of New York, for the purpose of establishing and maintaining a botanical garden and museum and arboretum therein, for the collection and culture of plants, flowers, shrubs and trees, the advancement of botanical science and knowledge, and the prosecution of original researches therein and in kindred subjects, for affording instruction in the same, for the prosecution and exhibition of ornamental and decorative horticulture and gardening, and for the entertainment, recreation and instruction of the people.

SEC. 2. Said corporation shall have all such corporate powers, and may take and hold by gift, grant or devise all such real and personal property as may be necessary and proper for carrying out the purposes aforesaid, and for the endowment of the same, or any branch thereof, by adequate funds therefor.

SEC. 3. Said corporation may adopt a constitution and by-laws; makes rules and regulations for the transaction of its business, the admission, suspension and expulsion of the associate members of said corporation, and for the number, election, terms and duties of its officers, subject to the provisions of this act; and may from time to time alter or modify its constitution, by-laws, rules and regulations, and shall be subject to the provisions of Title 3, of Chapter 18, of the first part of the Revised Statutes.

SEC. 4 The affairs of the said corporation shall be man-

aged and controlled by a Board of Managers as follows: The president of Columbia College, the professors of botany, of geology and of chemistry therein, the president of the Torrey Botanical Club, and the President of the Board of Education of the City of New York, and their successors in office, shall be ex-officio members of said corporation and of the Board of Managers, and *shall be known as the Scientific Directors; they* shall have the management and control of the scientific and educational departments of said corporation and the appointment of the Director-in-Chief of said institution, who shall appoint his first assistant and the chief gardener, and be responsible for the general scientific conduct of the institution. All other business and affairs of the corporation, including its financial management, shall be under the control of the whole Board of Managers, which shall consist of the Scientific Directors, *as herein provided*, and of the Mayor of the City of New York, the President of the Board of Commissioners of the Department of Public Parks, and at least nine other managers to be elected by the members of the corporation. The first election shall be by ballot, and held on a written notice of ten days, addressed by mail to each of the above-named incorporators, stating the time and place of election, and signed by at least five incorporators. Three of the managers so elected shall hold office for one year, three for two years, and three for three years. The term of officers of the managers elected after the first election, save those elected to fill vacancies in unexpired terms, shall be three years; and three managers and such others as may be needed to fill vacancies in unexpired terms shall be elected annually, pursuant to the by-laws of the corporation. The number of elective managers may be increased by vote of the corporation, whose terms and election shall be as above provided; *and members may from time to time be added to the Scientific Directors by a majority vote of the Scientific Directors, approved by a majority vote of the whole Board of Managers.* The Board of Managers shall elect from their number a Pres-

ident, Secretary and Treasurer, none of whom or of the Board of Managers, save the Secretary *and Treasurer*, shall receive any compensation for his services. *Nine corporators shall constitute a quorum at any meeting of the incorporators, but a less number may adjourn.*

SEC. 5. Whenever the said corporation shall have raised, or secured by subscription, a sum sufficient in the judgment of the Board of Commissioners of the Department of Public Parks in the City of New York, for successfully establishing and prosecuting the objects aforesaid, not less, however, than two hundred and fifty thousand dollars within *seven* years from the passage of this act, the said Board of Commissioners is hereby authorized and directed to set apart and appropriate upon such conditions as to the said Board may seem expedient, a portion of the Bronx Park, *or of such other of the public parks in the City of New York north of the Harlem River in charge of the said Department of Parks as may be mutually agreed upon between the said Board of Commissioners and the Board of Managers of said corporation in lieu of Bronx Park*, not exceeding two hundred and fifty acres, for establishing and maintaining therein by the said corporation a botanical garden and museum, including an herbarium and arboretum, and for the general purposes stated in the first section of this act. And the said Board of Commissioners is thereupon hereby authorized and directed to construct and equip within the said grounds so alloted, according to plans approved by them and by said Board of Managers, a suitable fire proof building for such botanical museum and herbarium, with lecutre rooms and laboratories for instruction, together with other suitable buildings for the care and culture of tender or other plants, indigenous or exotic, at an aggregate cost not exceeding the bonds hereinafter authorized to be issued by the City of New York; the use of said buildings upon completion to be transferred to said corporation for the purposes stated in this act. And for the purpose of providing means therefor, it shall be the duty of the Comptroller of the

City of New York, upon being thereto requested by said Commissioners, and upon being authorized thereto by the Board of Estimate and Apportionment, to issue and sell at not less than their par value bonds or stock of the Mayor, Aldermen and Commonalty of the City of New York, in the manner now provided by law, payable from taxation, aggregating the sum of five hundred thousand dollars, bearing interest at a rate not exceeding three per centum per annum, and *to be* redeemed within a period of time not longer than thirty years from the date of their issue.

SEC. 6. The grounds set apart, as above provided, shall by used for no other purposes than authorized by this act, and no intoxicating liquors shall be sold or allowed thereon. For police purposes and for the maintenance of proper roads and walks, the said grounds shall remain subject at all times to the control of the said Board of Commissioners of the Department of Parks; but otherwise, after the suitable laying out of the same and the construction of proper roads and walks therein by the Department of Parks, the said grounds and buildings shall be under the management and control of the said corporation. The said grounds shall be open and free to the public daily, including Sundays, subject to such restrictions only as to hours as the proper care, culture and preservation of the said garden may require; and its educational and scientific privileges shall be open to all alike, male and female, upon such necessary regulations, terms and conditions as shall be prescribed by the managers of those departments.

SEC. 7. This act shall take effect immediately.

MEMBERS OF THE CORPORATION.

Allen, Dr. Timothy F.
Britton, Prof. N. L.
Brown, Hon. Addison
Brown, Wm. L.
Kelly, Eugene, Jr.
Kemp, Prof. James P.
Kennedy, John S.
Low, Hon. Seth

Butler, Charles
Carnegie, Andrew
Chandler, Prof. Chas. F.
Choate, Wm. G.
Cooper, Hon. Edward
Cox, Chas. F.
Cruger, Col. S. V. R.
Cutting, W. Bayard
Daly, Hon. Chas. P.
Dana, Chas. A.
Dodge, Wm. E.
Draper, Dr. Wm. H.
Fairchild, Prof. Samuel W.
Fitzgerald, Gen. Louis
Gilder, Richard W.
Gilroy, Hon. Thomas F.
Godwin, Parke
Grant, Hon. Hugh J.
Hoyt, Henry P.
Jesup, Morris K.
Kane, John I.
Lydig, David
Maclay, Robert
Mills, D. O.
Morgan, J. Pierpont
Myers, Theo. W.
Nash, Stephen P.
Olcott, George M.
Ottendorfer, Oswald
Pitcher, James R.
Potter, Right Rev. Henry C.
Robertson, Wm. H.
Rockefeller, John D.
Rusby, Prof. H. H.
Schermerhorn, Wm. C.
Scrymser, James A.
Sloan, Samuel
Smith, Nelson
Strong, Wm. L.
Thompson, Dr. W. Gilman
Vanderbilt, Cornelius
Wood, Wm. H. S.

Officers, 1896.

President, Cornelius Vanderbilt,
Vice-President, Andrew Carnegie,
Treasurer, J. Pierpont Morgan,
Secretary, N. L. Britton.

Board of Managers, 1896.

1. *Elected Managers.*

Andrew Carnegie,
Charles F. Cox,
W. Bayard Cutting,
Charles P. Daly,
William E. Dodge,
John I. Kane,
D. O. Mills,
J. Pierpont Morgan,
James A. Scrymser,
Samuel Sloan,
Cornelius Vanderbilt.

2. *Ex-Officio Managers.*

Hon. S. V. R. Cruger, the President of the Department of Public Parks.

Hon. Wm. L. Strong, the Mayor of the City of New York.

3. *Scientific Directors.*

Seth Low, Chairman.

N. L. Britton,
Addison Brown,
C. F. Chandler,
J. F. Kemp,
Robert Maclay,
W. Gilman Thompson.

PROVISIONS FOR PATRONS, FELLOWS FOR LIFE AND ANNUAL MEMBERS.

1. *Patrons.*

The contribution of $5,000 or more to the funds of the Garden at any one time shall entitle the person giving the same to be a patron of the Garden. The number of patrons is limited to one hundred.

2. *Fellows for Life.*

The contribution of $1,000 or more to the funds of the Garden at any one time shall entitle the person giving the same to be a Fellow for Life of the Garden. The number of such Fellows is limited to five hundred.

3. *Annual Members.*

Annual members shall be elected by the Board of Managers. They shall pay a fee of $10.

Patrons, Fellows for Life, and Annual Members are entitled to the following privileges:

1. Tickets to all lectures given under the auspices of the Board of Managers, either at the Garden or elsewhere.

2. Invitations to all exhibitions given under the auspices of the Board of Managers.

3. A copy of all handbooks published by the Garden.

4. A copy of all annual reports.

LIST OF PATRONS.

J. Pierpont Morgan,
Andrew Carnegie,
Cornelius Vanderbelt,
John D. Rockefeller,
D. O. Mills,
Addison Brown,
Wm. E. Dodge,
Jas. A. Scrymser,
Wm. C. Schermerhorn,
Chas. P. Daly,
Oswald Ottendorfer,
Samuel Sloan,
George J. Gould,
Helen M. Gould.
John S. Kennedy,
William Rockefeller,
James M. Constable,
Esther Herrman,
Jas. R. Pitcher.

CONSTITUTION.

ARTICLE I.

The provisions of the act of incorporation approved April 28, 1891, as amended by Chapter 103 of the laws of 1894, approved March 7, 1894, are in pursuance of Section 3 of said act, adopted and form a part of this Constitution.

ARTICLE II.

A President, Vice-President, Secretary and Treasurer shall be elected yearly by the Board of Managers from their number in the manner provided by section 4 of the act of incorporation; and the persons so elected shall respectively be the President, Vice-President, Secretary and Treasurer of the Board of Managers and of the corporation. Vacancies in either of said offices may be filled by the Board of Managers until the next annual election.

ARTICLE III.

The Scientific Directors and the Board of Managers may respectively appoint such other persons and such committees to aid in the performance of the duties and business of their respective departments as they shall deem best.

ARTICLE IV.

The Scientific Directors and the Board of Managers are each authorized to adopt such by-laws, rules and regulations in their respective departments as shall be approved by them respectively, and also to change or amend the same from time to time; and the same when so adopted by them, shall be deemed the by-laws, rules and regulations of the corporation.

ARTICLE V.

Associate members may be admitted, suspended or expelled in the manner provided for by the rules adopted by the Board of Managers.

ARTICLE VI.

Patrons, life members and annual members may be created by the Board of Managers and admitted upon the payment of such sums as shall be approved and established by the Board.

ARTICLE VII.

Amendments to this Constitution not incompatible with the act of incorporation may be made by a vote of four-fifths of the members present at any regular meeting of the incorporators, or at any special meeting called for the purpose by the Secretary, upon the direction of the President, on ten days' prior notice by mail of such meeting and of the proposed amendments.

BY-LAWS.

I.

The annual meeting for the election of managers shall be held on the second Monday in January. A notice of such meeting shall be mailed by the Secretary to each of the incorporators at least ten days previous. The number of elective managers may be increased by vote of the corporation at any annual meeting, and also at any special meeting called upon the recommendation of the Board of Managers, upon like notice, and with notice of the proposed increase.

II.

At all meetings of the corporation the President shall preside; or, in his absence, the Vice-President.

III.

The Secretary shall give notice of the meetings of the corporation, and take and preserve the minutes thereof, and shall perform such other duties as usually pertain to the office of Secretary.

The Treasurer shall collect, receive, invest and disburse the funds of the corporation as directed by the Board of Managers.

IV.

The election of Managers shall be by ballot. All other votes at meetings of the corporation may be taken *viva voce*, unless a ballot be demanded by some member, whereupon the vote shall be taken by ballot.

REPORT OF THE SECRETARY FOR 1895.

The Board of Managers elected February 12, 1895, has held meetings on March 21st, May 7th, June 18th and October 9th.

The Managers met for organization on March 21st, and elected the following officers:

President, Mr. Cornelius Vanderbilt.
Vice President, Mr. Andrew Carnegie.
Treasurer, Mr. J. Pierpont Morgan.
Secretary, Prof. N. L. Britton.

They appointed the following Finance Committee: Messrs. Vanderbilt, Morgan, Daly, Dodge, Cox, Carnegie and Scrymser. They approved the previous action of the Scientific Directors, adding Prof. W. Gilman Thompson to that Board. In accordance with the power given them by the Corporation they elected Mr. Samuel Sloan a Manager for the term of three years and Mr. Wm. C. Schermerhorn a

Manager for the term of two years. Mr. Schermerhorn, feeling obliged to decline this office, Mr. John I. Kane was subsequently elected in his stead. They referred the examination of the site of the Garden to the Scientific Directors.

At the meeting of May 7th the President stated that the subscriptions to the Endowment Fund had reached $238,000, and the Secretary reported that the Scientific Directors were in consultation with the Commissioners of Public Parks relative to the land to be selected.

On June 18th the President, reporting for the Finance Committee, stated that the sum of $250,000.00, required by Act of Incorporation, had been fully subscribed, as follows:

Columbia College,	$25,000
J. Pierpont Morgan,	25,000
Andrew Carnegie,	25,000
Cornelius Vanderbilt,	25,000
John D. Rockefeller,	25,000
D. O. Mills,	25,000
Hon. Addison Brown,	25,000
Wm. E. Dodge,	10,000
Jas. A. Scrymser,	10,000
Wm. C. Schermerhorn,	10,000
Hon. Chas. P. Daly,	5,000
Oswald Ottendorfer,	5,000
Samuel Sloan,	5,000
George J. Gould,	5,000
Helen M. Gould,	5,000
John S. Kennedy,	5,000
Wm. Rockefeller,	5,000
Arnold, Constable & Co.,	5,000
Morris K. Jesup,	2,500
Mrs. Melissa P. Dodge,	1,000
Tiffany & Co.,	1,000
Hugh N. Camp,	500
	$250,000

Also a subscription of $5,000 by Jas. R. Pitcher, to be paid in plants.

The Chairman of the Scientific Directors reported that after consultation with the Commissioners of Public Parks the northern part of Bronx Park had been selected as the most desirable site for the Garden.

The following resolutions were then adopted:

1. WHEREAS, The Endowment Fund of $250,000 called for by the Act of Incorporation has been fully subscribed,

Resolved, That the President be, and is hereby, directed to notify the Board of Commissioners of Public Parks of this fact, and to ask them to set apart 250 acres of land in Bronx Park for the use of the Botanical Garden, as required by said Act, and to request the Board of Estimate and Apportionment to authorize, and the Comptroller to issue $500,000 of the Stock of the Mayor, Aldermen and Commonalty of the City of New York for the purpose of erecting suitable and adequate buildings thereon.

2. *Resolved*, That it be referred to the Scientific Directors of the New York Botanical Garden, with power, to agree with the Department of Public Parks as to the 250 acres of Bronx Park to be assigned to the uses of the Garden.

3. *Resolved*, That a Special Committee of Five, consisting of the President, the Secretary, the Chairman of the Board of Scientific Directors, Mr. W. E. Dodge and Judge Brown, be and hereby is appointed, with power to agree with the Park Board as to the plans for laying out the Garden, and with power to obtain or agree upon with the Park Commissioners plans for the buildings, and if they deem it necessary to engage, for a period not exceeding six months, the services of a Superintendent of the Garden.

4. *Resolved*, That whenever the Park Commissioners have set apart the land in Bronx Park for the uses of the Garden, the President be, and is hereby, directed to certify the fact to the subscribers to the Endowment Fund, and to notify them that their subscriptions are binding, in accordance with the

terms thereof, and that thereupon a call be made upon the subscribers for the payment to the Treasurer of 50 per cent. of their subscriptions.

5. *Resolved*, That the Finance Committee be and hereby are directed to invest the moneys paid in as above mentioned in their discretion, so as to earn income from which to pay expenses as they may hereafter accrue.

6. *Resolved*, That the Finance Committee be, and they are hereby, directed to continue their efforts for the increase of the Endowment Fund, and with power to make a general appeal to the public, by means of circulars and newspaper articles, as they may deem proper.

The President notified the Commissioners of Public Parks of the adoption of the first of these resolutions on June 19th, and on July 31st the following action was taken by the said Commissioners:

"*Resolved*, That the Commissioners of Parks approve the selection of the site for the Botanical Garden in Bronx Park, and, as authorized by Chapter 103 of the Laws of 1894, hereby appropriate two hundred and fifty acres or less for that purpose, as shown and described on map No. 568, dated July 26, 1895, signed Calvert Vaux, Landscape Architect, and Samuel Parsons, Superintendent of Parks, provided that the restrictions for the protection of the hemlock grove and the lines as drawn and approved be consented to by the Trustees of said Botanical Garden."

The restrictions referred to in the above resolution are as follows:

"That no cutting down or pruning of trees, no planting, cultivating or laying out any portion of the reservation termed on accompanying map of Bronx Park 'Hemlock Grove,' shall be undertaken by the Botanical Garden authorities, except in the presence of and with the consent and direction of a duly deputed representative of the Department of Public Parks."

"That the preservation of the natural beauty of the Hemlock Grove may be fully maintained in case a difference of

opinion should arise in regard to any proposed method of treatment of said grove, the power of final decision shall rest with the Department of Public Parks."

On October 23d the Commissioners of Public Parks adopted the following resolution:

"*Resolved*, That the Board of Estimate and Apportionment be respectfully requested to authorize the Comptroller of the City to issue bonds to the amount of $500,000 in the manner provided by Section 1 of Chapter 103, Laws of 1894, amending Section 5 of Chapter 285, Laws of 1891, for the construction and equipment of the buildings, etc., required for the purposes of the Botanical Museum, Herbarium, etc., described in the law cited, to be established on the grounds allotted therefor in Bronx Park."

The following resolution was adopted by the Board of Estimate and Apportionment on October 30th:

"*Resolved*, That pursuant to the provisions of Chapter 285 of the Laws of 1891, as amended by Chapter 103 of the Laws of 1894, the Comptroller be and is hereby authorized to issue bonds in the name of the Mayor, Aldermen and Commonalty of the City of New York, to be known as 'Consolidated Stock of the City of New York,' as provided by section 132 of the New York City Consolidation Act of 1882 to an amount not exceeding twenty-five thousand dollars ($25,000), redeemable within such period as the Comptroller may determine but not more than thirty years from the date of issue and bearing interest at a rate not exceeding three per cent. per annum, the proceeds of which shall be applied to the preliminary expenses necessary for making surveys, plans, etc., for the Botanical Museum, Herbarium, etc., described in said law, and referred to in the resolution of the Board of Parks, relating thereto, adopted October 23, 1895."

On August 13th the President of the Board of Managers notified the subscribers of the action taken by the Board of Parks, and called on them for 50 per cent. of their subscriptions to the Endowment Fund.

At the meeting of the Board of Managers, held October 9th, the Treasurer reported that $85,000 of the Endowment Fund had been paid in. On the recommendation of the Scientific Directors the following appropriations were made for the purposes specified:

For a survey and map of the site, ...	$2,000.00
For electrotyping and printing,.....	20.00
For the planting of a temporary nursery,....	500.00
For labelling the larger trees of the tract,..	500.00
For the use of the Scientific Directors,....	250.00
For the purchase of a collection of seeds for planting, ...	5.00

The following resolutions, adopted by the Scientific Directors at a meeting held August 19th, were reported:

WHEREAS, The Board of Commissioners of the Department of Public Parks have, in accordance with the request of the New York Botanical Garden, allotted and set apart for the uses of said Garden, two hundred acres of land or less in the northern part of Bronx Park, as shown upon a map thereof numbered 568 and signed by Messrs. Vaux and Parsons, and filed with said Department of Parks; and

WHEREAS, By the terms of said allotment certain restrictions are imposed against cutting down on pruning trees or making other changes in the "Hemlock Grove" included in said two hundred and fifty acres, except as in said allotment provided; therefore

Resolved, That the said allotment with the restrictions, as aforesaid, be and they hereby are adopted and accepted.

The following action was taken:

WHEREAS, The Board of Scientific Directors have reported the foregoing preamble and resolutions as to the allotment of grounds:

Resolved, That the action of the Scientific Directors is hereby approved and ratified, and that the allotment of grounds for the Botanical Garden as made by the Department of Parks

be, and the same hereby is, accepted, with the restrictions as in said allotment provided.

The Board of Managers also adopted the following resolutions at this meeting:

Resolved, That the honorable Commissioners of Public Parks be, and they hereby are, requested to cause the extension of the driving road in the Mosholu Parkway across the New York and Harlem Railroad into Bronx Park; or, in case this should be impracticable at the present time, to indicate, to the Scientific Directors of the New York Botanical Garden, the point at which said driving road will enter Bronx Park, over a bridge, across said railroad, when constructed, in order to facilitate the laying out of the Garden.

Resolved, That the said Commissioners be, and they hereby are, requested to cause the construction of the driveways in the area set aside by them for the New York Botanical Garden in Bronx Park, in accordance with Section 6, Chapter 285, Laws of the State of New York for 1891.

Resolved, That the said Commissioners be, and they hereby are, requested to consult and agree with the Special Committee of the Managers on plans and buildings of the Garden, and relative to the positions and character of the roads.

The Special Committee of the Board of Managers on Plans and Buildings has not yet completed its report, but considerable progress has been made. The character, position and interior arrangement of the museum building and glass houses have been studied, the position of the driveways and entrances have been largely determined under advice from the late Mr. Calvert Vaux; the drainage of the tract and the relations to be perserved between the natural and artificial landscape features have been considered. It is hoped that these studies will be sufficiently advanced to permit the erection of at least one building, the construction of part of the road system, and of some permanent planting during the coming year.

The Scientific Directors have held meetings on May 8, May 24, August 19, 1895 and January 9, 1896. They were

occupied during the spring and summer, with the selection of the site for the Garden, and their action in this matter has been above reported. On August 26, they contracted through a committee, with Mr. A. H. Napier, Civil Engineer, for a topographical survey of the tract, and a map drawn on the scale of fifty feet to the inch, with five foot contours. Unforeseen difficulties in the field work of this survey, and the untimely death of Mr. Napier, have delayed the completion of this map, but it is now finished, and was submitted to the Directors on January 9th and accepted. It will form a satisfactory basis for all work in developing the Garden.

The preparation of a seal for the Garden was referred by the Managers to the Directors, and this is being considered by a committee.

The educational work of the Garden has been fairly inaugurated in two ways:

1. By the labeling of the larger trees standing in the area by a committee of the Scientific Directors. There are not fewer than 500 of these, of about 40 different kinds, excluding those forming the Hemlock Grove. About 100 have been labeled, and labels are ready or in process of making for some 200 more. The labels have been observed with interest by the large number of persons who visited the Park during the autumn. The work of affixing them may go on more rapidly on the approach of warm weather.

2. On the authorization of the President of the Board of Managers, arrangements were made with Dr. D. Morris, Assistant Director of the Royal Gardens at Kew, who was in New York for a few days on his way to the Bahamas, to deliver an illustrated lecture on "The Rise and Progress of the Royal Botanical Gardens at New, England." Through the kind coöperation of the President of the American Museum of Natural History, this lecture was delivered in the large lecture hall of that institution on the evening of December 17. It was enjoyed by an audience of about 550 persons.

Very respectfully submitted,

N. L. Britton, *Secretary*.

REPORT OF THE TREASURER FOR 1895.

NEW YORK BOTANICAL GARDEN IN ACCOUNT WITH J. PIERPONT MORGAN, TREASURER.

1895.			
June	20,	Arnold Constable & Co.,.....	$5,000.00
Aug.	17,	James A. Scrymser, ...	5,000.00
"	19,	Wm. Rockefeller, ...	2,500.00
"	19,	Tiffany & Co., ...	500.00
"	19,	Wm. E. Dodge,.....	5,000.00
"	19,	Mrs. Melissa P. Dodge, ...	1,000.00
"	20,	Miss Helen M. Gould, ...	2,500.00
"	21,	Cornelius Vanderbilt, ...	12,500.00
"	24,	Hugh N. Camp, ...	250.00
"	26,	John S. Kennedy, ...	2,500.00
"	26,	Wm. C. Schermerhorn, ...	5,000.00
"	27,	John D. Rockefeller, ...	12,500.00
"	28,	Morris K. Jesup, ...	1,250.00
"	28,	George J. Gould, ...	2,500.00
Sept.	12,	D. O. Mills,.....	12,500.00
"	12,	Samuel Sloan, ...	2,500.00
Oct.	8,	J. Pierpont Morgan, ...	12,500.00
"	14,	Oswald Ottendorfer, ...	5,000.00
"	26,	John McL. Nash, Treasurer Trustees Columbia College,	12,500.00
Nov.	27,	Addison Brown, ...	12,500.00
Dec.	21,	Andrew Carnegie, ...	12,500.00
"	31,	Int. on Credit Balances @ 2%,	679.04
Jan.	13,	Mrs. Esther Herrman, ...	5,000.00
			$133,679.04

Oct.	31,	Prof. N. L. Britton, Sundry Bills.....	$196.30	
Dec.	4,	Prof. N. L. Britton, Sundry Bills,.....	398.94	
Jan.	2,	Prof. N. L. Britton, Sundry Bills,.....	79.84	
		Balance, ...	$133,003.96	$133,679.04
		Balance carried down, ...		$133,003.96

E. & O. E., New York, January 13, 1896.

J. P. MORGAN, Jr.
For J. PIERPONT MORGAN, *Treasurer.*

AGREEMENT WITH COLUMBIA UNIVERSITY.

THIS AGREEMENT, made at the City of New York, this eighth day of January, one thousand eight hundred and ninety-six, between THE NEW YORK BOTANICAL GARDEN, party of the first part, and THE TRUSTEES OF COLUMBIA COLLEGE in the City of New York, party of the second part,

Witnesseth, That THE TRUSTEES OF COLUMBIA COLLEGE have agreed and by these presents do agree to deposit the Herbarium and Botanical Library belonging to the College (except such minor part thereof as it shall deem necessary for undergraduate instruction at the College) with the NEW YORK BOTANICAL GARDEN, at the request and for the use of said Garden, upon the considerations and for the purposes and subject to the conditions following:

1. That the officers and students of Columbia College may freely consult and use the same as heretofore, as well as the Library and Herbarium collected by the Garden, and that both the Library and Herbarium of the College shall be kept satisfactorily insured by the Garden.

2. That Columbia College, either alone or in coöperation with other institutions, may conduct university courses at the Garden for graduate or advanced students in botany and kindred subjects, which shall be free to their own students, and, as the authorities of the Garden may prescribe, to students at the Garden or from other institutions; that the reasonable use of the laboratories and floral material from the Garden needed for study shall also be available to such officers and students without charge, subject to any necessary regulations by the authorities of the Garden.

3. That all courses of instruction given at the Garden shall likewise be open to the officers and students of Columbia College without charge; and so far as reasonably practicable, botanical material needful for study shall be supplied to Columbia College for undergraduate work, as well as to other colleges, the public schools and other public educa-

tional institutions, subject to the regulations of the Garden authorities.

4. That students studying at the Garden who are not matriculated students of Columbia College or of any other college, may be admitted without charge, on the request of the authorities of the Garden, to such courses at Columbia as said authorities may recommend and the College approve.

5. That the Columbia Library and Herbarium and all accessions thereto made by the College or in its behalf, while on deposit at the Garden shall be kept distinguishable from the Library and Herbarium of the Garden, by such means as shall be approved by the College, so as to be easily separable in case of removal.

6. That Columbia College reserves the right to retain or to recall at any time so much of its Herbarium and Botanical Library as it may deem necessary for use in undergraduate instruction.

7. That either party may terminate this arrangement on one year's notice to the other.

RECENT PROGRESS.

The Committee on Plans have submitted specifications for the Museum Building to eight firms of architects, and have called for plans and estimates from them not later than May 15th. They have commissioned three other firms to submit plans and estimates for the first horticultural house at the same time. They have made progress with the general plan for the development of the tract, and have arranged for the planting of a screen of trees along the northern side of the Garden, bordering the New York and Harlem Railroad, during the present month.

The Board of Managers, on the recommendation of the Scientific Directors, have purchased the extensive herbarium of Mr. J. B. Ellis, of Newfield, N. J., containing some 75,000 specimens of fungi. This valuable and unique collection, together with a considerable number of botanical books, also

obtained from Mr. Ellis, has been brought to New York and deposited in a fireproof warehouse to await its transferral to the Museum Building.

Mr. W. Bayard Cutting has been elected a member of the Board of Managers.

The Endowment Fund has been increased by $10,000 by the generosity of Mrs. Esther Hermann.

The Committee on Annual Members have issued a circular containing the provisions printed on page seven of this BULLETIN, to about five thousand persons.

The lectures in coöperation with the American Museum of Natural History, inaugurated by Dr. D. Morris on December 17, 1895, will be followed by others. Two are arranged for April:

Lecture No. 2: "Natural Scenery and Landscape Gardening," by L. H. Bailey, Professor of Horticulture in Cornell University, on Saturday Evening, April 11th.

Lecture No. 3: "Illustrations of the Desert Flora of Southern California," by Frederick V. Coville, Chief of the Division of Botany, U. S. Department of Agriculture, on Saturday evening, April 18th.

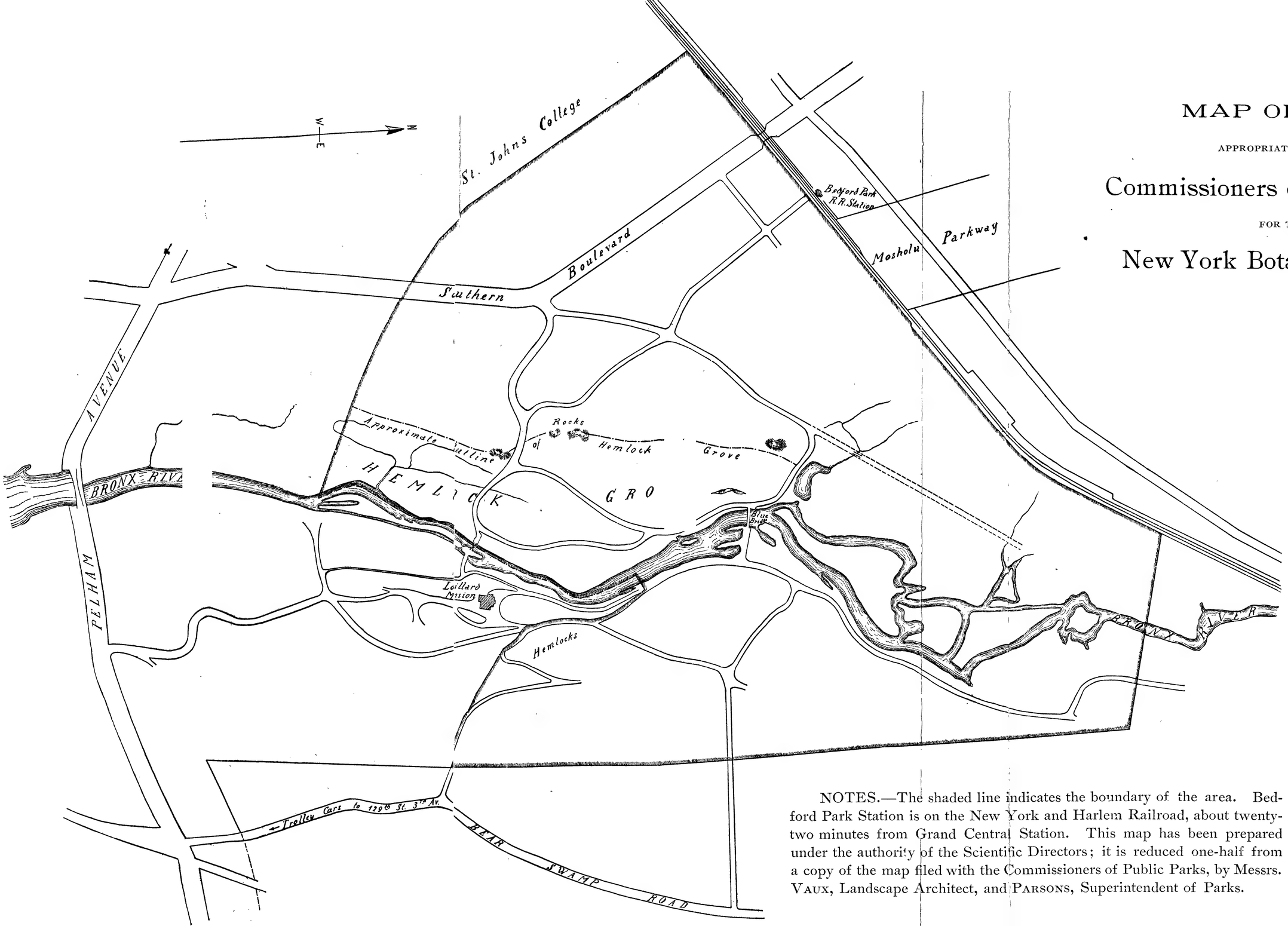
MAP OF SITE

APPROPRIATED BY THE

Commissioners of Public Parks

FOR THE

New York Botanical Garden.



NOTES.—The shaded line indicates the boundary of the area. Bedford Park Station is on the New York and Harlem Railroad, about twenty-two minutes from Grand Central Station. This map has been prepared under the authority of the Scientific Directors; it is reduced one-half from a copy of the map filed with the Commissioners of Public Parks, by Messrs. VAUX, Landscape Architect, and PARSONS, Superintendent of Parks.

VOL. I. NO. 2.

BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN.

CONTENTS:

REPORT OF THE PLANS COMMISSION, ACCEPTED DECEMBER 12, 1896, . 23
REPORT OF THE COMMITTEE ON PLANS, ACCEPTED DECEMBER 12, 1896, . 47
GENERAL PLAN FOR THE ARRANGEMENT OF THE MUSEUMS, ADOPTED JUNE 9, 1896, . 50
PROVISIONAL REGULATIONS FOR THE OFFICE OF DIRECTOR-IN-CHIEF, ADOPTED JUNE 17, 1896, 52
AMENDMENT TO THE ACT OF INCORPORATION, . . 54
LIST OF ANNUAL MEMBERS TO DECEMBER 12, 1896, . 56
ADDRESS ON BOTANICAL GARDENS, 62
THE DIVERSION OF THE BRONX RIVER FROM ITS OLD CHANNEL, 78
GENERAL PLAN OF THE GROUNDS.

[ISSUED, JANUARY 1, 1897.]

OFFICERS, 1896.

PRESIDENT—CORNELIUS VANDERBILT,
VICE-PRESIDENT—ANDREW CARNEGIE,
TREASURER—J. PIERPONT MORGAN,
SECRETARY—N. L. BRITTON.

BOARD OF MANAGERS.

1. ELECTED MANAGERS.

ANDREW CARNEGIE,
CHARLES F. COX,
W. BAYARD CUTTING,
CHARLES P. DALY,
WILLIAM E. DODGE,
JOHN I. KANE,
D. O. MILLS,
J. PIERPONT MORGAN,
JAMES A. SCRYMSER,
SAMUEL SLOAN,
CORNELIUS VANDERBILT.

2. EX-OFFICIO MANAGERS.

HON. SAMUEL MACMILLAN,
THE PRESIDENT OF THE DEPARTMENT OF PUBLIC PARKS.
HON. WM. L. STRONG,
THE MAYOR OF THE CITY OF NEW YORK.

3. SCIENTIFIC DIRECTORS.

SETH LOW, CHAIRMAN.

ADDISON BROWN,
C. F. CHANDLER,
J. F. KEMP,
ROBERT MACLAY,
W. GILMAN THOMPSON,
L. M. UNDERWOOD.

DIRECTOR-IN-CHIEF.

N. L. BRITTON.

BULLETIN

OF

The New York Botanical Garden

Vol. I. JANUARY 1, 1897. No. 2.

REPORT OF THE PLANS COMMISSION.

(*Submitted November 30, 1896.*)

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN,

Gentlemen: At a meeting of your honorable board, held June 17, 1896, the following resolution was adopted:

Resolved, That the preparation of the general plan of development be referred to a commission, consisting of the Director-in-Chief; Mr. R. W. Gibson, architect of the museum building; Mr. John R. Brinley, civil and landscape engineer; Prof. Lucien M. Underwood, of the Scientific Directors; Mr. Samuel Henshaw, landscape gardener, and a representative of Messrs. Lord & Burnham, architects of the horticultural houses, with instructions to report to the Board in the autumn.

Mr. Lincoln Pierson, Secretary of the Lord & Burnham Co., was delegated by that firm as their representative.

On October 9th the Commission met in conference with your Committee on Plans, and presented the general plan in an outline form, for suggestions. After consideration and slight modification, the Committee approved the plan and directed the Commission to complete it, and transmit to the Board, together with an explanatory report.

The Commission would, therefore, submit the following report and the accompanying plans, which include:

1. A plan showing the positions, and the amount of space occupied by the several elements; and

2. A map showing the proposed systems of subsoil and surface drainage, grading, water supply and sewerage.

It was determined to submit the design in this divided form, in the belief that a single plan, in which all these features were embodied, would be too complicated for ready reference.

1. General Considerations.

Your Commission has endeavored to preserve the natural features of the tract so far as possible without prejudicing the location of driveways, buildings and the scheme of planting, and it is a matter of congratulation, we believe, that all the general natural features of the area have been found to lend themselves to the artificial improvements without any loss of beauty or effect. Portions of the tract are abundantly supplied with trees, and where the driveways are planned through these portions it has been found necessary to sacrifice certain of the trees, but every effort has been made, by studying each individual tree affected, and by establishing the driveways so as to avoid perfect and healthy individuals, to save these, while poorer ones have been selected for removal. At a very few points the grades necessary, and the rounded character of the curves which are imperative in a public park, have necessitated the selection of trees for removal, which we would have been glad to retain, but the number so selected is so insignificant, as compared with the total number, that we feel that they need not be seriously considered, especially as all of them are abundantly represented at other points in the Garden.

Access to the site of the Garden is now obtained:

1. By means of the Harlem division of the New York Central & Hudson River Railway at the Bedford Park Station, located immediately on the western margin of the Garden.

2. By a trolley line on Webster Avenue, one block west of the western edge of the Garden, extending north to a point

opposite Bedford Park Station, running south to Harlem Bridge, and connecting with the trolley systems of all that part of the city lying north of the Harlem, and will doubtless be extended to Williamsbridge, or beyond.

3. By the trolley cars on the Bear Swamp Road, which run from West Farms to Mt. Vernon and pass the whole Garden site a short distance to the east.

4. By the Southern Boulevard, which is a fine driving road and which intersects the Park.

5. By Newell Avenue, which approaches the site from Williamsbridge. When other streets are opened to the north and east of the Park, and the driveway in the Mosholu Parkway is carried over the railroad, access for both conveyances and pedestrians will be materially increased.

It will thus be seen that the area has every desirable facility for ready accessibility, and we may expect that this will be taken advantage of by many thousands of people in the near future.

With this consideration in mind, the Commission has planned to so place the several elements of interest, the driveways and paths, as to effect a ready distribution of crowds of people and large numbers of vehicles. The Commission has not been unmindful of the economic features of the plan, but has sought to so arrange that there shall be a minimum of waste in the expenditure of money as the development proceeds, having especially in mind the desirability of avoiding temporary construction, but hoping to make every step of progress a portion of the complete institution.

2. Entrances.

It is evident that for some years, at least, the principal foot entrances will be at Bedford Park Station and at the Mosholu Parkway, and that the Mosholu Parkway will furnish the principal driving entrance, as it is a portion of the Park system extending from Pelham Bay to Van Cortlandt. As the districts east and north of the Park are built up, the Garden

will doubtless be approached by many from these directions. We have planned entrances as follows, beginning at the south-western corner.

1. The Southern Boulevard, already built.
2. The Bedford Park Station.
3. The Mosholu Parkway driveway and paths.
4. A footbridge at Scott Avenue, about midway between the Mosholu Parkway and the northern border of the Garden.
5. Provision for space for another railway station at the northwestern corner of the tract.
6. Driveway and path approaches from Williamsbridge at Newell Avenue.
7. A foot entrance on the eastern side about fourteen hundred feet south of the northern border.
8. Driveway and path approaches from Bleecker Street on the eastern side.
9. A foot entrance about one thousand feet south of Bleecker Street.
10. Driveway and path approaches at the extreme south-eastern corner of the tract.
11. A driveway and path approach from the part of Bronx Park lying south of the Garden tract, at the Lorillard Mansion.
12. A foot path and entrance from the part of Bronx Park situated south of that portion of the Garden tract west of the Bronx, near the river.
13. A foot path and entrance from the part of Bronx Park situated south of that portion of the Garden tract west of the Bronx, at the Herbaceous Grounds.
14. The Southern Boulevard approaching from the south.

It is believed that the entrances are sufficiently numerous. In fact, for reasons of economy in gatemen, we have felt that they were almost too numerous, but it is not probable that they will all be brought into operation at once, and the construction of numbers 5, 7, 9, 12 and 13 may be deferred for some time.

Gatemen's shelter houses should ultimately be placed at all the entrances.

3. Borders.

We advocate the ultimate construction of a stone wall around the entire tract, except along the southern boundary, where the land adjoins the rest of Bronx Park, with suitable posts and pillars at the entrances. The character of this wall should be rough, and it may be partly built of material taken from several different ledges and from the loose stones which are abundant in certain parts of the park. At the entrances themselves this construction should be somewhat more formal, and the posts or pillars should be of cut stone. The height of this wall should not exceed five feet. The border plantations should effect in great part a screening of the tract from the surrounding region, leaving points of view from without, carefully selected with regard to the surroundings. These border plantations would thus, for the most part, be formed of rather high growing trees, flanked on the inner side by shrubbery suitably grouped, and their average width, when complete, should not be less than fifty or sixty feet. The southern border, from the Southern Boulevard to the Bear Swamp road, along which the Garden land abuts against the other land of Bronx Park, should be excepted from this treatment, and the Park and Garden land allowed to blend.

4. Driveways.

The general system of driveways for the portion of the Garden lying west of the Bronx was planned by the late Calvert Vaux, shortly before the sad accident which caused his death. We have carefully studied this proposed system and have found no reason to differ from it essentially, except on one line which we have moved about three hundred feet to the north to effect a better connection with the driveway system east of the Bronx, which Mr. Vaux did not study, than his original suggestion would have accomplished. To this plan

of Mr. Vaux we have added a system of driveways east of the Bronx.

The system, as thus unified, may be described as follows:

The Southern Boulevard, already constructed, is to be treated as a park road; the portion of the tract lying south of the Southern Boulevard to be provided with a driveway forty feet in width, commencing at a point on the Southern Boulevard three hundred feet east of the railway, and ending on the Boulevard again, where it curves to the south, following very closely the present surface of the ground, necessitating very little grading except where it re-enters the Southern Boulevard, where some filling will be necessary; a broad plaza is planned in front of the Bedford Park Station, to allow a liberal space for carriages and pedestrians as they enter or leave the trains; the driveway in the Mosholu Parkway to be carried over the railroad at a heigth of about eighteen feet above the tracks, and approached from the Garden side by a driveway forty feet in breadth, which must rise on an embankment; this, we presume, will be the most notable driving entrance to the park for many years; the continuation of this driveway to the Southern Boulevard at the bend of the latter to be forty feet in breadth; the plaza in front of Bedford Park Station to be connected with this driveway by a forty-foot road, and also with the Southern Boulevard by another piece of road of equal width; all this driveway system in the vicinity of Bedford Park Station follows nearly the present surface of the ground, with the exception of the embankment approach to the Mosholu Parkway already alluded to. A longitudinal driveway system for the portion of the park west of the Bronx is effected by means of a thirty-five to forty foot road, commencing opposite Bedford Park Station, on the connection of the Mosholu Parkway with the Southern Boulevard, and extending to the northern end of the tract, following the natural surface very nearly, except where it crosses a depression at present containing a bog which is described below in this report, and which the commission recommends

be occupied by a lake; here we recommend the construction of a stone bridge, on arches, about 100 feet long and 14 feet high. The road entering from the parkway connects with this longitudinal system by a driveway 40 feet in width, running north nearly parallel with the railway tracks, about 100 feet, crossing the bog at a level lower than that of the railway, thus permitting the almost complete masking of the trains from vehicles, and ascending beyond the bog to the plateau selected for the fruticetum, thence curving to the east, crossing this longitudinal system, continuing to the east across the Bronx over a stone bridge, about 300 feet long and 20 feet high, and continuing in general the same direction to the eastern side of the park at Bleecker Street entrance, No 8. A longitudinal system east of the Bronx is accomplished by carrying the northern end of the longitudinal system west of the Bronx over the river on a short stone bridge at a point near the northern end of the tract, connecting with the Newell Avenue entrance, thence extending southerly along the river to the driveway above described as running from the fruticetum to the Bleecker Street entrance, and continued south through the arboretum to the southeastern corner of the area; a connection between this road and the Lorillard Mansion, lying just south of the Garden tract, is effected by an already existing road. A driveway 30 to 35 feet wide commences at the bend of the Southern Boulevard, and runs through a valley just east of the first horticultural house, expanding into a large plaza opposite the dome, to join with the longitudinal system west of the Bronx; finally, a plaza is proposed immediately in front of the new railway station suggested at the northwestern corner of the Garden.

It is recommended that all these driveways be of Telford-McAdam construction, built of from 10 to 12 inches of large stone, about 4 inches of smaller stone, with a top-dressing of screenings, and that they be provided with grass gutters along their whole length, except at a few points where the steeper grades will not permit of this feature.

5. Paths.

The system of paths has been designed with a view to effect the ready distribution of crowds of people to the several portions of the Garden, and their width varies from 10 to 25 feet. It is assumed that it will be desirable to keep people to the paths as much as possible through the decorative grounds, but that this restriction will not be rigidly enforced, for the present at least, through the pinetum, the deciduous arboretum, the fruticetum, or the forest areas; in these tracts there will be no immediate danger of destruction by permitting visitors to wander at will, but experience has shown that, even with the permission, there is a strong tendency to keep to the paths when they are once built. This consideration has led us not to propose as extensive a path system through these portions of the ground as we should have done if a more rigid restriction to the paths had been necessary. Two features of the path system demand special notice:

1. The straight formal approach to the front of the Museum Building, where a central path and two lateral parallel narrower paths are suggested, the central one to be used as a driveway on special occasions, but ordinarily as a walk.

2. The broad curving path connecting the Museum Building with the First Horticultural House.

It is recommended that the whole path system, with the exception of that portion of it extending through the Hemlock Reservation be also built on the Telford-McAdam plan, with about five inches of larger stone and three inches of smaller stone on top, including about one inch of screenings. The paths through the Hemlock Grove should be of gravel.

Further allusion to the position of paths will be made in discussing the general features of the deciduous arboretum, the pinetum and the fruticetum.

6. Buildings and their Locations.

Acting on general instructions from your Committee on Plans, the Commission has provided locations for buildings as follows:

1. *The Museum Building.*—This, as determined by your Board from designs submitted by Mr. R. W. Gibson and accepted, is to have a front of about 304 feet, with two equal lateral wings, their total completed length about 200 feet, depth 50 feet, and a central feature projecting beyond the main structure, both to the front and rear. The decision of your Committee on Plans, reported to your Board on March 4, 1896, and adopted, to place the museum building on the elevated land about 1,000 feet east of Bedford Park Station, has been very carefully considered by your Commission, and the whole Garden tract has been again carefully and repeatedly studied to learn if any better site was available. Several different suggestions were informally received by the Commission and critically considered. But after this study and a consideration of the other elements of the problem your Commission unanimously decided that the site selected is incomparably better than any other within the tract. It provides the desirable features of proximity to Bedford Park Station and to the Mosholu Parkway; an unexcelled soil for foundations; its altitude above the surrounding land provides unsurpassed facilities for drainage and a very commanding position. It will permit the erection of the edifice with plenty of room between it and the driveways, and will allow of nearly double the dimensions of the Museum in the future, even after the lateral wings shall have been completely built. It also permits of so placing the heat and power house that this shall serve both the Museum and the First Horticultural House, an advantage which will permit of very economic administration of these important features; the plateau on which it is planned to rest does not necessitate an unreasonable amount of grading, as little perhaps as we could hope to expect in a region so diversified.

2. *The First Horticultural House.* We recommend that this be erected on a plateau lying in front of Bedford Park Station and distant from it about 1,300 feet, its central entrance distant from the central entrance of the Museum Building about 900 feet. This site was selected after long

study and the decision to adopt it was unanimously reached by the Commission on account of the ready possibility of heat ing the house from the common power house above mentioned, its proximity to the railroad station and to the Southern Boulevard, the abundant tree growth all around it which permits a very beautiful treatment, enough large and perfect trees to partially mask the building and protect it from winds being already in position, a perfect system of drainage being secured, and withal a conspicuous position. It is believed that this will be one of the most beautifully located glass houses in the world. The design submitted by Messrs. Lord & Burnham, and accepted by your Board on June 17, 1896, has been slightly modified to fit this site, its front elevation remaining the same, while the wings have been changed in position, but the amount of space afforded in the two designs is very nearly the same, providing now for two half courts, each to contain ultimately a tank for aquatics. We regard the original design as considerably improved. The area of this house will be about one-third the aggregate area of the glass houses at the Royal Gardens at Kew, England.

3. *Heat and Power House.* This structure is located almost between the Museum and the First Horticultural House, and distant from each of them about 300 feet. The boilers will be placed at a lower elevation than the basements of either building, so as to afford an upward slope for the connecting steam pipes. It will be a low building, most of it below the surface of the ground, and will be almost surrounded by standing trees, so that its chimney will be inconspicuous. It is so planned as to permit of future extension.

4. *Director's House.* A residence for the Director-in-Chief is located east of the Bronx within the deciduous arboretum, on high ground, distant from the river about 500 feet, and from the easterly edge of the Garden about 500 feet.

5. *Head Gardener's House.* This is located within the edge of the forest border east of the First Horticultural House, and distant from it about 200 feet.

6. *Second Gardener's House.* This is located near the easterly border of the Garden, in immediate proximity to the propagating houses and nurseries.

7. *Propagating Houses.*—These have been located very near the eastern border, on land sloping to the south and protected from the north and west by a dense fringe of standing trees. The cold frames and nurseries are in immediate proximity, it being regarded as highly desirable that all the work of propagation should be concentrated on a limited tract and at a place in the Garden removed from ready access by the visiting public.

8. *Stable.*—A stable and accompanying wagon sheds are planned near the Bleecker Street entrance on the east side of the park, convenient to the nurseries and propagating houses.

9. *Rain Shelters.*—It is deemed desirable that provision for refuge from sudden showers, additional to the large buildings, should be made, and points for three rustic buildings have been selected.

10. *Four Closet Groups* are planned for positions as indicated on the map, in proximity to the sewers.

11. *Second Horticultural House.*—A second glass house of greater area than the one above described, is planned for future construction on land south of the Southern Boulevard, to be partially surrounded by the pinetum. This may be heated from the common power house.

7. Specimen Trees.

In planning the positions of roads, paths and planted areas, careful attention has been given to the preservation of all the perfect and healthy standing trees possible. The areas to be treated as forest will be subsequently described. In the systematic planting of the pinetum, the deciduous arboretum and the decorative grounds, these specimen trees have been kept, even if they came into positions not demanded by the arrangement adopted. The arrangement of the deciduous arboretum has been so adapted that in many cases they come in place.

8. Decorative Grounds.

The tracts about the buildings and most of the entrances, some 25 acres in all, are treated from a purely decorative standpoint, with no attempt at scientific classification. The details of the planting of these areas can be worked out to the best advantage after the roads and paths are built and the buildings erected. The general features proposed are indicated on the plan.

9. Pinetum.

It is recommended that the southwestern portion of the tract be devoted to the collection of coniferous trees, the soil and exposure of this land being admirably adapted to their successful cultivation. It is very little wooded at the present time, and the tree growth now upon it is, for the most part, unimportant. We have designated a number of specimen trees now standing there for retention. The pinetum will be intersected by the Southern Boulevard and by the proposed driveway and path system south of the Southern Boulevard. It will be bounded on the east by the area recommended for the herbaceous grounds, and on the north by the decorative grounds about Bedford Park Station and in front of the Museum Building. We find that between 90 and 100 species of coniferous trees can probably be successfully cultivated in our latitude, and the tract admits of placing these in a nearly natural sequence, allowing for from two to five permanent individuals, the larger ones to stand not less than 100 feet apart. In the planting of the pinetum it is recommended that a number of trees, at least four times in excess of the total number planned as permanent, be planted, in order that a selection of the best individuals may be made as the plantation grows. The detailed grouping and relative positions of the different species are indicated upon the plan. The area taken is about 30 acres.

10. Deciduous Arboretum.

We recommend that the part of the tract east of the Bronx

be devoted to the collection of hardwood trees, with the exception of an area toward the southern end reserved for forest, a narrow fringe of trees along the Bronx extending north about to the present "Blue Bridge," and an area in the northern part of the tract reserved for open meadows. The tract remaining is much diversified in character, affording a great variety of soil and exposure, and is in places rather densely wooded, in other places meadow. We find that about 275 species of deciduous trees, exclusive of some 40 others which, while sometimes trees, are small and hence best treated as shrubs in the fruticetum, may be expected to grow in our latitude, and allowing a large number of fine specimen trees, already standing in this area, to remain, that they can be so located in a nearly natural sequence as to allow two or three permanent individuals of each species. It is here recommended, as in the case of the pinetum, that the primary planting be much in excess of the number planned for permanent trees.

The arboretum will be intersected by the longitudinal road system east of the Bronx for its entire length, and also by the transverse driveway ending at Bleecker Street. The path system has been so planned as to bring individuals of every natural family into view, and representatives of most of the families will also be in view from the driveways. The arboretum will surround the director's house, the second gardener's house, the propagating houses, the stable, the nurseries and the Economic Garden. Its area is about 70 acres.

It is recommended that the change of this tract from its present condition to a completed arboretum be effected very gradually, and that comparatively few standing trees be removed until the planted arboretum trees have grown to a considerable height, each particular case to be treated from a consideration of its immediate surroundings. By retaining the large number of specimen trees which the plan calls for, and applying the above recommended treatment, the tract, which already supports some 30 species of trees, will always

be beautiful, and the standing trees will supply very desirable protection to the new ones as they grow up.

11. Fruticetum.

The plateau west of the Bronx, bordered on the south by the present bog, on the west by the New York & Harlem Railway, and on the north by the bog garden, is selected as a most desirable tract to be devoted to the systematically planted collection of shrubs. It is structurally a terrace, the upper soil being two or three feet of loam, the lower portion to the depth of at least 12 feet is a coarse gravel. There are no trees worthy of permanent preservation growing upon it. We find that about 850 species of shrubs, exclusive of numerous other species, which are on the border line between herbs and shrubs, or else are low woody plants, and which we plan to grow in the herbaceous grounds, may be expected to thrive in the open in our latitude. We have carefully assigned space for each of the families, following a nearly natural sequence, arranged in a curving line around and through the middle of the tract, leaving considerable areas of greensward between each family. The arrangement is thus very elastic, permitting nearly double the space which we have allotted to be ultimately devoted to each family, without disturbing the natural sequence.

The systematic grouping of the shrubs in the fruticetum does not in any way contemplate their rejection in the planting of the arboretum; and it is proposed that the paths and driveways in the arboretum be bordered, to a greater or less extent, by shrubs of the same natural families as the trees in their immediate vicinity, planted, however, not for specimens, but mainly for landscape effect.

The fruticetum is intersected by a portion of the longitudinal driveway system west of the Bronx, by the transverse system extending from the Mosholu Parkway to the Bronx and Bleecker Street, and by paths so located in relation to the planting that all the genera of shrubs cultivated shall be easily

visible from them. The space selected measures about 15 acres.

12. Viticetum.

The cultivation of either herbaceous or woody vines, either in the herbaceous grounds or in the fruticetum, is regarded as difficult, owing to the amount of labor necessary in preventing them from growing over or shading other plants, and we recommend that all vines be grouped together in a collection by themselves, the climbing and twining ones placed on arbors, poles and walls, and the trailing ones given space to spread at will. We have located this viticetum to the east of the northeastern portion of the First Horticultural House, in a tract which provides open space for the sun-loving species, and shade for those which require it. Much of this collection will be visible from the driveway running to the east of the the First Horticultural House, and all will be seen from the paths which extend northward from the First Horticultural House to the site of the proposed lake.

This grouping of the vines for systematic presentation will in no way prevent their use in decorative effect elsewhere in the Garden.

13. Herbaceous Grounds.

Space for the systematic collection of herbaceous plants has been selected in a glade at the southern end of the tract, lying about 200 feet east of the Southern Boulevard, and bordered to the east by the present forest. The tract, except for a border of trees to the west and the forest border to the east, is without trees at the present time. It is a meadow sloping from a brook which runs longitudinally through it, bordered by some marshy land, to the forest border on the east and the fringe of trees separating it from the pinetum to the west. Rock edges occur on both sides of the tract. The site, therefore, provides opportunity for aquatics, for marsh plants, for meadow plants, for hillside plants, for rock plants, and for those which demand the shade of the forest. By

means of a critical study of the existing surface, and a slight modification of the position of the brook, we have been able to arrange the families in natural sequence, and to provide soil and exposure desirable for every species which will probably exist in the open in our latitude. Abundant space for each group is assured, together with a large margin of safety. The brook which intersects these herbaceous grounds, while flowing most of the year and fed by springs, is sometimes dry in summer, and in order to effect a constant flow we have planned to turn into it the waste water from the First Horticultural House, which is to stand on a plateau immediately at the head of this valley. A further supply of water for this brook may be obtained from the overflow from the rockery. The area of the Herbaceous Grounds is about 8 acres.

14. Rockery.

In addition to the facilities for growing rock-loving plants afforded by the edges of the herbaceous grounds, a rockwork is planned for the cultivation of such, mainly for decorative effect, and in locating this we have taken advantage of a ledge of gneiss extending from a point about 200 feet east of the southern side of the First Horticultural House southerly to a point east of the herbaceous grounds. This affords both sunlight and shade in any proportion which proves desirable. In order to utilize the river water for the rockery and for the herbaceous grounds, we have planned to place a water engine on the Bronx below the gorge to pump water to a small tank situated on a ledge in the forest, which will supply plenty of pressure for distributing the water along the rockery and through the valley to the south and west.

15. Bog Garden.

There are large numbers of trees, shrubs and herbs whose natural habitat is in bogs, swamps or marshes, and while some of these will grow if cultivated on dry soil, they will all thrive better if grown in their natural habitat. With this con-

sideration in view we have devoted a portion of the low land near the northwestern end of the tract to a bog garden, and have supplied abundant space for the successful cultivation of all such plants as will exist in the open in our latitude. It is recommended that no strictly systematic arrangement be attempted here beyond the grouping of species of the same genus. Approximately 5 acres are planned for this feature.

16. Lakes and Ponds.

It is recommended that the bog, now occupying the depression between the elevated land for the Museum site and the fruticetum, be excavated to a depth of about six feet and made into two lakes, separated by the longitudinal driveway system west of the Bronx; the surface of the westerly lake to be established at a slightly higher level than that of the eastern one, and the surface of the eastern one to be about two feet above the level of the Bronx, when the river shall be lowered to effect the necessary drainage of the northern part of the tract. These lakes may be fed by two streams now running through the Mosholu Parkway; one of these streams, which takes its rise in the lost water from the Williamsbridge reservoir, runs at present into the bog and supplies a constant stream of sufficient volume to keep both lakes full. With this brook properly protected and enclosed in a pipe, an efficient water supply would be obtained. The other stream in the Mosholu Parkway rises in the Parkway, a mile or so from the Garden site, and flows through the Parkway for its entire length; it is at present diverted into the Webster Avenue sewer. It supplies a larger volume of water than the one above described, and we have found, by leveling, that it runs under Webster Avenue at an altitude about two feet higher than that of the culvert under the New York & Harlem Railway, which carries the first stream described into the Garden. As this second stream rises within the Parkway, and the Parkway furnishes most of its watershed, it is not liable to contamination at the present time, and will be less liable as the city s

sewerage system is extended to the land bordering the Park way. We, therefore, recommend that a pipe connection be made from the point where this stream flows under Webster Avenue, to the culvert above mentioned; the two streams, thus united, would yield a very abundant water supply for these lakes. In case any serious contamination of these streams should take place, the lakes may be fed from the city water supply, as in Central Park.

A small pond is planned for the bog garden, as shown on the map, as part of the drainage system.

Two ponds for hardy aquatics are located on the eastern side of the Bronx, south of the transverse driveway.

The total water area, exclusive of the Bronx, is about 6 acres.

17. The Bronx.

It is recommended that the Bronx River be lowered about two feet from the Lorillard Mansion to the northern end of the Park, by removing about two feet of stone from the top of the mill dam at the Lorillard Mansion, in order to effect the successful drainage of the northern part of the site, to reduce the amount of back water in the valley in the vicinity of the present "Blue Bridge," and to permit the establishment of the lake levels, as above described, all of which is necessary to insure good sanitary conditions in the park and the surrounding country. The mill dam was erected by the Lorillard family in order to provide water power for tobacco and snuff mills at the southern end of the gorge. Its usefulness for this purpose has long passed away, and it is at present a very unnatural feature. The lowering of the dam, as above indicated, will cause a narrowing of the stream for a distance of about 800 feet south from the present "Blue Bridge," and will permit the beautifying of the eastern bank of the river along that stretch, which at present is occupied by overgrown swamps and back water pools, the western side being formed by the Hemlock Forest. We regard the present water level of the dam, with its straight front, as altogether out of place in the

surrounding landscape, and much would be gained by restoring the stream to a condition nearer its natural one. We, therefore, recommend that, instead of simply lowering the dam, there be built up against it, in front of the fall, an irregular pile of rocks, the tops of some of them projecting above the upper water level, which would break up the even character of the present fall into a foaming cascade, which would be in harmony with the forest and much more beautiful than the present unnatural mill dam. Above the "Blue Bridge" the banks of the river will require some attention from time to time, and a part of its reach through the northern meadow may ultimately be advantageously walled, but a judicious planting of trees and shrubs, in addition to those now in position, will probably protect the banks at most points. A small amount of dredging is apparently indicated as desirable by the soundings at points above the "Blue Bridge," but no great amount is evidenced.

The lowering of the water will be beneficial to certain of the trees in the immediate vicinity of the banks, by relieving them from a surplus supply of moisture which they now endure. There have already been a number of trees, killed by drowning and by the action of ice on their roots, removed from the valley.

Through the meadows at the northern end of the site the Bronx at high water now occupies two channels, and it is recommended that it be restricted to one, which will be feasible when the stream is lowered as above described.

18. Economic Garden.

A collection of plants selected on account of their useful products has usually found place in botanical gardens, and we regard the feature as a desirable one. The collection should be grouped as far as possible by the products, and this will be also largely in their relationships from a botanical standpoint; the tract recommended for this collection lies within the deciduous arboretum, east of the Bronx, in a glade devoid of trees and with excellent soil; a maximum space of about one

acre has been selected, and the paths so located as to make it readily accessible.

19. Permanent Nurseries.

It is recommended that the permanent nurseries should be used primarily for the cultivation of species not readily obtainable from the numerous commercial nurseries of the vicinity, and especially for the culture of species designed for the systematic plantations, and for experimental purposes. Plants which are to be used in very large quantities for the decorative grounds and borders can mostly be obtained from the commercial nurseries for a less expenditure of money than if cultivated in the Garden. With this fact in mind we have not provided a very large space for permanent nurseries, regarding about two acres as sufficient for the purpose, taken in connection with the large extent of border plantations, which can be temporarily utilized as nurseries for most of the woody plants. Temporary nurseries may also be planted at other points, as desired.

As noted under our discussion of propagating houses, we have placed the nurseries in the immediate vicinity of these structures.

20. Forest Areas.

The areas occupied by forest at the present time are in our plan left almost wholly undisturbed. They are:

1. The Hemlock Grove Reservation, together with a belt of forest bordering it to the west.

2. A small area of hemlocks on the eastern side of the Bronx and at the southern border of the Garden.

3. An area of swampy woods on the west side of the Bronx to the east of the fruticetum; this will be completely drained by the lowering of the river. We regard these forest areas as very important features to preserve. Their total area is approximately 65 acres.

21. Meadows.

In our discussion of the decorative grounds and the fruticetum allusion has been made to tracts of greensward, and much

additional space for grass plots will be found in the pinetum and deciduous arboretum. In addition to these we propose to retain the present meadow land bordering the bog garden and the Bronx at the northern end of the tract, and to increase it somewhat by reclaiming several acres of swampy land now overgrown by coarse herbs and shrubs. This, however, can not be properly accomplished without first lowering the water in the Bronx. The area of this tract is about 10 acres.

22. Water Supply.

It is proposed to have a complete system of piping to reach not only all the buildings, but also all roads, walks and plantations. This can best be accomplished by tapping the 36-inch water main which runs through the Park, at a point nearly in front of the proposed site of the Museum Building, with an 8-inch pipe, and continuing the same to the power-house. From this 6-inch branches are taken: (1) to the Museum Building; (2) to the First Horticultural House along the loop-road, and thence to the pinetum in the south-western part of the tract and to the region in front of Bedford Park Station, thence northerly along the driveway running parallel with the railroad to the fruticetum and to the intersection of this driveway with a longitudinal driveway system west of the Bronx, where it closes on branch 3; (3) along the longitudinal driveway west of the Bronx to the northern end of the Garden, across the Bronx to the Newell Avenue entrance, thence southward along the longitudinal driveway east of the Bronx to the bridge, at which point it connects with another 6-inch main. From the intersection of the road north of the proposed lake a 6-inch branch is taken across the Bronx, and so on to supply the Director's House, the propagating houses, the nurseries; from this main, connection may be made to the Lorillard Mansion. All these pipes are located along the proposed roads, rather than under them; they are so arranged that hydrants can be placed along the roadsides at intervals, so that by using hose any parts of the roads, walks and plantations can be reached.

As bearing on this subject the following letter is filed:

DEPARTMENT OF PUBLIC WORKS,
Commissioner's Office,
150 NASSAU STREET, NEW YORK, July 14, 1896.

N. L. BRITTON, ESQ.,
Director-in-Chief, N. Y. Botanical Garden,
41 East 49th Street.

Dear Sir: I am in receipt of your letter of 11th inst., referring to mine of the 7th, and beg to say that as the 36-inch water main near Bedford Park is the only one at present convenient to Bronx River Park, there is no objection to furnishing a reasonable supply of water from that main for the New York Botanical Garden, and this Department would approve a proper plan for making connection with the main for that purpose.

Very respectfully,
HOWARD PAYSON WILDS,
Deputy Commissioner of Public Works.

23. Sewage Disposal.

The Williamsbridge sewer, recently constructed, affords ample opportunities for connections from any part of the grounds. It is proposed to run an 8-inch sewer from the First Horticultural House past the Museum Building, connecting with the Williamsbridge sewer just before this leaves the Garden; a branch from this 8-inch pipe serves the head gardener's house, and another the Museum Building; a subsequent connection may readily be made with it to reach the Second Horticultural House, planned for the tract south of the Southern Boulevard. A six-inch sewer is proposed to connect the director's house, second gardener's house, propagating houses and stable, with the pipe-sewer running from Sheridan Street to the Bronx, where this empties into the Williamsbridge sewer.

24. Grading.

For so large a tract of land, and considering the roughness of the country, comparatively little grading will be required.

The buildings, roads, walks and bridges have been so located as to necessitate the least amount of work. Some little grading will have to be done at the site of the Museum Building, but the materials from here will all be needed to bring the road in front of the building high enough to obliterate the embankment over the thirty-six-inch water main which runs through the property at this point. At the site of the First Horticultural House there will be hardly enough excavating to make the necessary filling. The approaches to the two proposed bridges will require considerable filling; but in one case portions of the earth excavated from the proposed lakes will be brought into play, in the other there will probably be enough filling obtained from the grading of the roads located nearby.

25. Surface Drainage.

By a system of catch-basins and underground drains we propose to carry all the surface water from the roofs, roads, walks and other areas to the nearest water courses.

The catch basins are located at intervals along the roads and at other points where necessary to prevent all washing and the forming of pools.

The drain pipe should be not less than three feet under ground and not less than six inches in diameter.

26. Subsoil Drainage.

In connection with the surface drainage a system of subsoil drains has been planned, the object being to reclaim all swamp lands, except those needed for the bog garden, and to keep the roads and walks through the meadows in a perfectly dry state.

The pipes used in this work should be porous tile with collars, what are known as subsoil drain tile; they should be placed from two to four feet under the present surface.

It will readily be seen by studying the plans that to accomplish the desired result it will be necessary to lower the water in the Bronx as heretofore referred to. In connection

with this work all the swamp holes should be filled with good soil, and portions of the surface roughly graded as indicated on the accompanying plan, so as to lead the surface water to the catch basins planned in connection with the drains.

27. Illuminating Gas.

The gas supply for the buildings and driveway lamps may be obtained from the main in the Southern Boulevard.

28. Reserve Areas.

Areas which may be adapted to special features other than those here discussed, may be found: (1) In the forest border between the Herbaceous Grounds and the Hemlock Grove; (2) In the region in the rear of the Museum Building; (3) In portions of the meadow land at the northern end of the park.

The foregoing report is presented as a general description of the accompanying plan, and of its several elements. This plan has purposely been prepared in a very elastic way, in order that it may readily accommodate itself to modifications in detail, as the development of the Garden proceeds.

The detailed treatment of the several portions should be made the subject of separate plans, drawn to at least twice the scale here used, and these may be elaborated when the general plan is approved.

It will be apparent that the tract is most admirably adapted to all the purposes for which it is to be used, both from the scientific side of the institution, and for "the entertainment, recreation and instruction of the people."

Respectfully submitted,

N. L. Britton, *Director-in-Chief.*

R. W. Gibson, *Architect.*

John R. Brinley, *Civil and Landscape Engineer.*

Lucien M. Underwood,

Professor of Botany, Columbia University.

Samuel Henshaw, *Landscape Gardener.*

Lincoln Pierson, *Secretary, Lord & Burnham Co.*

New York, November 30, 1896.

REPORT OF THE COMMITTEE ON PLANS.

Submitted December 14, 1896.

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN:

The Standing Committee on Plans, to which was referred the report of the Plans Commission, dated November 30, 1896, respectfully reports its approval of the provisional plan submitted by the Commission for the development of the Garden, with the recommendation that it be adopted.

During the work of the Commission this Committee has been kept constantly informed of its progress, and has been from time to time informally consulted on various important points. From this previous knowledge, as well as from the Commission's printed report and accompanying maps, and from repeated inspection and study of the grounds, this Committee would express its approval both of the work of the Commission and of its methods.

A botanical garden is a combination of various different elements. No one person would probably claim to be an expert in all; nor can any one botanic garden be taken as a simple model for another. Each is a special study, having reference to its site and topography. In our case, especially from the diversified character of the ground, frequent and careful study of it on the spot was indispensable. This has been obtained from competent experts in the various departments, who, being employed here, were able to give, in the fullest degree, constant personal attention and repeated inspection on every point. Besides this, the Committee has sought the advice of the persons in this country believed to have had the most experience in such enterprises, so far as they were accessible to the Committee; while several of its individual members, during the past five years, have endeavored, by repeated visits to the principal gardens of Europe, to obtain the benefit of the widest experience there. In Mr. Vaux, for planning the road system, we have had the highest

expert skill. Mr. Olmstead's valuable aid, which was first sought, could not be obtained, in consequence of his illness and absence in Europe.

There are three main divisions of the general plan upon which some brief observations may be pertinent, viz.: the location of the driveways; the location of the buildings, and the allotment of grounds to the different departments.

1. *The location of the driveways.* The most important of these, viz.: those on the west side of Bronx River (with a minor exception) were planned and located by Mr. Vaux, as above stated. They were his last work. His location of the roads has largely controlled the plan of all the other landscape designs.

2. *The location of the buildings.* Practically there was but this alternative: either to group the principal buildings together, at the extreme southerly end on the ground adjoining that of St. John's College; or to separate them by placing the Museum and the first glass house upon the central elevations, as shown upon the plan submitted, reserving the southerly site for a second glass house hereafter. The grouping plan would be preferable where the buildings are not likely to be visited by large masses of people; but it is wholly inadmissible when such masses are to be anticipated. During the last summer 400,000 people visited Kew Garden in one day. Some day a like number of visitors must be expected here. To make possible the proper management and proper supervision of such masses, and to prevent them from becoming dangerous to each other and destructive to the Garden, an easy and natural division of any such crowds, by a separation of the buildings of most interest, is a prime necessity. This was the one point most strongly insisted upon by Dr. Morris, of Kew, on his visit to our grounds last Spring, on being made acquainted with our original plan. As founder of many botanic gardens under the direction of Kew, he has had probably a greater experience in such undertakings than any other man in the world. His advice was followed by this Committee in a former report, ratified

by your Board; and the Plans Commission on reëxamination has strongly sustained this same arrangement.

3. *The allotment of the grounds* gives:

(a) For the buildings, with their decorative approaches and surroundings, about,..... .... 25 acres
(b) For the pines and other coniferous trees, say 90 to 100 species,..... .... 30 acres
(c) For the deciduous trees, about 275 species,..... 70 acres
(d) For natural forest, mostly undisturbed, including the Hemlock Grove,..... 65 acres
(e) For shrubs and small trees,..... 15 acres
(f) For herbaceous grounds for plants arranged scientifically,..... 8 acres
(g) Bog garden at the northerly end,..... 5 acres
(h) Lakes and ponds, exclusive of the Bronx River,..... 6 acres
(i) Meadows at the northerly end, reserved,..... 10 acres
(j) Various provisions for aquatics, vines, rockeries, etc.

This affords a satisfactory division of our allotted area; and if more ground should be desired for forestry, as has been recommended by some experts, the adjacent lands to the south would afford a connected extension of the forest grounds, either under the administration of the Park Commissioners or under the Garden management, should their administration of it be desired.

The Committee deem it unnecessary to refer specifically to the many other points so fully treated in the Report of the Plans Commission. We are satisfied that the general plan submitted is adequate and satisfactory, and in all material respects as good as can be framed. Its provisions for fine artistic, architectural, decorative and landscape effects are obvious. If the ground is studied with map in hand, the plan speaks for itself and is its own vindication. Without such study the plan cannot be properly appreciated.

It is most gratifying, and a matter of congratulation, to observe that almost every part of these diversified grounds can be, and has been, availed of, and appropriated to the most apt and beautiful uses; and that this is done not only

without sacrificing any of their unique natural charms, but with great additions to their natural beauty.

All-important as this matter is, our Committee are confident that there will be no mistake in the adoption of the design recommended by the Commission, as a provisional plan of the Garden, sufficiently establishing its chief outlines, while easily admitting, without prejudice, a large elasticity in treatment, and abundant room for modifications in detail as may be hereafter desired.

The Committee therefore submits the following resolution:

Resolved, That the report of the Plans Commission, submitted November 30, 1896, be accepted, and the accompanying general plan be adopted, subject to such changes and alterations as may hereafter be found necessary.

ADDISON BROWN,
Chairman.

The foregoing report and resolution were unanimously adopted.

N. L. BRITTON,
Secretary of the Board of Managers.

GENERAL PLAN FOR THE ARRANGEMENT OF THE MUSEUMS.

Adopted by the Scientific Directors, June 9th, 1896.

First Floor.

It is proposed to devote the entire first floor to the economic museum, illustrating useful plates, their crude and commercial products, together with, so far as possible, the processes of manufacture. The illustration will be effected by specimens, material, photographs, plates, drawings and models, and the display arranged by products as follows:

1. Food plants.
2. Drug plants.

3. Fibre plants.
4. Timber plants.
5. Plants yielding essential oils.
6. Plants yielding fixed oils.
7. Plants yielding resins.
8. Plants yielding gums.
9. Plants yielding waxes.
10. Plants yielding starch and glucose.
11. Plants yielding sugar.
12. Plants yielding beverages.
13. Plants yielding dyes and mordants.
14. Plants used in smoking.
15. Plants of miscellaneous economic application.
16. Plants used by the American Indians.

The objects to be used in effecting this plan of illustration will be drawn from a great variety of sources, and it will take much time to make any one of the subjects complete. Much material can be obtained through commercial houses and from similar museums in America and Europe, without any great expenditure of money.

Second Floor.

A. *General Botanical Museum.*

This is to be arranged systematically from the most lowly organized to the most complex plants, in sequence, illustrating types of the natural families by specimens of the plants themselves, and by fruits, seeds, bark, leaves, roots and other organs, photographs, plates and drawings.

As with the economic collections, the material will be drawn from every available source, but in this instance more is to be expected from museums or collections already established than from commercial houses.

B. *Physiological Museum.*

This collection will be planned to illustrate the phenomena and processes of plant life, and would consist mainly of models, drawings and specimens.

C. *Palæo-botanical Collection.*

This should illustrate, by means of selected specimens, the sequence of the appearance of the various groups of plants upon the earth and their distribution in time. The material can be brought together by exchanges with various geological museums.

D. *Illustration of the Flora of the Region of 100 Miles about New York City.*

It is planned to effect this by mounting carefully prepared herbarium specimens in swinging frames on upright posts, in somewhat the manner adopted at the South Kensington Museum for the British Flora. Much of this material is already in hand, and much more can be obtained at slight expense by systematic collecting. This will also be arranged systematically, and include, ultimately, all the species and varieties of plants known to occur in the region. It has been shown at South Kensington that such an exhibit is most instructing and is examined by a great many people.

E. *Space will remain unassigned for special collections of one kind or another.*

PROVISIONAL REGULATIONS FOR THE OFFICE OF DIRECTOR-IN-CHIEF.

Adopted June 17, 1896.

1. The Director-in-Chief is the Executive Officer of the Garden, and is responsible to the Board of Managers, and to the Scientific Directors, for the general management and control of all its departments.

He shall promptly and efficiently carry out all their regulations and directions, and be responsible for the proper maintenance and good order of the buildings and grounds.

2. He may from time to time make recommendations for the development and management of the Garden in all its

departments, including the laying out of the grounds, the construction of buildings and the conduct of the museums, the herbarium or any of the departments of the Garden, accompanying the same by his estimate of the probable cost therefor.

3. He shall recommend the employment of such persons as shall be needed for the various departments of the Garden and have power to remove all employees, except those upon a salary. All salaried employees he shall have power to suspend, and, on approval of the appropriate committee or board, to discharge.

4. He shall make all necessary purchases of tools, implements and supplies for the Garden as authorized, and shall be responsible for the proper inventory, care, and use of the same.

5. He shall examine, correct and certify all bills incurred under his management, and shall keep, in books provided for that purpose, an accurate account of his expenditure of all appropriations made for Garden purposes, which books, together with proper vouchers, shall at all times be open to inspection by members of the Board.

6. He shall keep a copy of his official correspondence.

7. He shall use diligent efforts to build up the Garden Herbarium, the Library and the Museum, and the collections of living plants and trees, by correspondence, by exchanges of duplicates not needed, and by purchases, so far as means therefor are placed at his disposal.

8. He shall report to the Board of Managers, the Scientific Directors or special committees, in such manner and at such times as they may direct.

9. He shall make no expenditures and incur no liabilities, except under appropriations made by the Board.

10. He shall devote his whole time and energies to the promotion of the Garden interests, and shall not engage in any outside work except with the approval of the Board or the Executive Committee.

AMENDMENT TO THE ACT OF INCORPORATION.

CHAPTER 717.

(LOCAL.)

An Act *to amend* chapter two hundred and eighty-five of the laws of eighteen hundred and ninety-one, entitled "An act to provide for the establishment of a botanic garden and museum and arboretum, in Bronx Park, in the city of New York, and to incorporate the New York Botanical Garden for carrying on the same," as amended by chapter one hundred and three of the laws of eighteen hundred and ninety-four.

Accepted by the city.
Became a law May 19, 1896, with the approval of the Governor.
Passed, three-fifths being present.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

SECTION 1. Section five of chapter two hundred and eighty-five of the laws of eighteen hundred and ninety-one, entitled "An act to provide for the establishment of a botanic garden and museum and arboretum, in Bronx Park, in the city of New York, and to incorporate the New York Botanical Garden for carrying on the same," as amended by chapter one hundred and three of the laws of eighteen hundred and ninety-four, is hereby amended to read as follows:

SECTION 5. Whenever the said corporation shall have raised or secured by subscription a sum sufficient, in the judgment of the board of commissioners of the department of public parks in the city of New York, for successfully establishing and prosecuting the objects aforesaid, not less, however, than two hundred and fifty thousand dollars, within seven years from the passage of this act, the said board of commissioners is hereby authorized and directed to set apart and appropriate, upon such conditions as to the said board may seem expedient, a portion of the Bronx Park, or of such other of

the public parks in the city of New York north of the Harlem River in charge of the said department of parks as may be mutually agreed upon between the said board of commissioners and the board of managers of said corporation in lieu of Bronx Park, not exceeding two hundred and fifty acres, for establishing and maintaining therein by the said corporation a botanical garden and museum, including an herbarium and arboretum, and for the general purposes stated in the first section of this act. And the said board of commissioners is thereupon hereby authorized and directed to construct and equip within the said grounds so allotted, according to plans approved by them and by the said board of managers, a suitable fire-proof building for such botanical museum and herbarium, with lecture rooms and laboratories for instruction, together with other suitable buildings for the care and culture of tender or other plants, indigenous or exotic, at an aggregate cost not exceeding the bonds hereinafter authorized to be issued by the city of New York; the use of said buildings upon completion to be transferred to said corporation for the purposes stated in this act. And for the purpose of providing means therefor, it shall be the duty of the comptroller of the city of New York, upon being thereto requested by said commissioners, and upon being authorized thereto by the board of estimate and apportionment, to issue and sell at not less than their par value bonds or stock of the mayor, aldermen and commonalty of the city of New York, in the manner now provided by law, payable from taxation, aggregating the sum of five hundred thousand dollars, bearing interest at a rate not exceeding *three and one half per centum* per annum, and to be redeemed within a period of time not longer than thirty years from the date of their issue.

SECTION 2. This act shall take effect immediately.

LIST OF ANNUAL MEMBERS, DEC. 14, 1896.

Frank Abbott, M. D.,
A. G. Agnew,
Wm. C. Alpers,
G. Amsinck,
J. M. Andreini,
Jno. D. Archbold,
Edw. S. F. Arnold, M. D.,
Frederic Baker,
Geo. V. N. Baldwin,
N. A. Baldwin,
Robert F. Ballantine,
Ewald Balthasar,
Amzi Lorenzo Barber,
E. W. Barnes,
John S. Barnes,
Chas. T. Barney,
William Barr,
E. W. Bass,
Thos. H. Bauchle,
Gerard Beekman,
M. H. Beers,
Statts S. Bell,
August Belmont,
Geo. H. Bend,
Mrs. Adolph Bernheimer,
Chas. L. Bernheimer,
Simon Bernheimer,
Simon E. Bernheimer,
Edward J. Berwind,
Henry Beste,
Eugene P. Bicknell,
Isaac Bijur,
Mrs. Elizabeth Billings,
Chas. H. Bissell,
Geo. Blagden,
Mrs. Birdseye Blakeman,
Louis H. Blakeman,
Mrs. S. A. Blatchford,
Geo. T. Bliss,
Frank S. Bond,
H. W. Bookstaver,
Geo. S. Bowdoin,
John M. Bowers,
Michael Brennan,
Chas. Astor Bristed,
John D. Bristol,
W. F. Brittain,
Mrs. Harriet Lord Britton,
F. Bronson,
John Crosby Brown,
Robert I. Brown,
H. B. Brundrett,
William Bryce, Jr.,
W. Buchanan,
Albert Buchman,
Wm. Allen Butler,
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George Calder,
Henry L. Calman,
James C. Carter,
Wm. J. Cassard,
John H. Caswell,
Frank R. Chambers,
Chester W. Chapin,
Geo. E. Chisolm,
Mrs. Wm. E. Chisolm,
Jared Chittenden,
W. F. Chrystie,
E. Dwight Church,
John K. Cilley,
John Claflin,
Wm. N. Clark,
Banyer Clarkson,
Frederick Clarkson,

Wm. F. Cochran,
Miss Mary T. Cockcroft,
C. A. Coffin,
Chas. H. Coffin,
E. W. Coggeshall,
Samuel M. Cohen,
N. A. Colburn,
Miss Ellen Collins,
Casimir Constable,
C. T. Cook,
Miss Julia Cooper,
Geo. Coppell,
C. H. Coster,
Chas. J. Coulter,
Allyn Cox,
Francis Crawford,
Robert L. Crawford,
Frederick Cromwell,
Edwin A. Cruikshank,
Ira Davenport,
Wm. Gilbert Davies,
Richard Deeves,
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Maturin L. Delafield, Jr.,
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Chas. F. Dieterich,
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Mrs. Wm. E. Dodge, Jr.,
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L. F. Dommerich,
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J. D. Flower,
Col. De Lancey Floyd-Jones,
James B. Foid,
John R. Foid,
Edw. W. Foster,
Mrs. A. Frankfield,
Joel Francis Freeman,
Samuel A. French,
Henry Gade,
Frank S. Gannon,
Joseph E. Gay,
S. J. Geoghegan,
V. P. Gibney,
Frederic N. Goddard,
W. N. Goddard,
E. L. Godkin,
Ogden Goelet,
Simon Goldenberg,

Frederic Goodridge,
Francis Goodwin,
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Geo. J. Gould,
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Chas. T. Harbeck,
Joseph W. Harper,
Marcellus Hartley,
G. G. Haven,
R. Somers Hayes,
J. Waldemar Hayward,
Homer Heminway,
Edmund Hendricks,
Samuel Henshaw,
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Adrian Iselin, Jr.,
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Robert Martin,
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Payson Merrill,
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John Monks,
Alphonse Montant,
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Geo. H. Morgan,
A. H. Morris,
A. Newbold Morris,
Henry Lewis Morris,
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Wm. Nelson,
Geo. G. Nevers,
Geo. L. Nichols,
A. Lanfear Norrie,
Gordon Norrie,
E. E. Olcott,
Dwight H. Olmstead,
Robert Olyphant,
Adolphe Openhym,
Mrs. Wm. Openhym,
Miss Helen Parish,
John E. Parsons,
J. M. Patterson,
Geo. Foster Peabody,
Alfred Pell,
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Clarence Sackett,
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Miss Jane E. Schmelzel,
Paul Schoeder,
S. L. Schoonmaker,
Carl H. Schultz,
C. Schumacher,
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T. G. Sellew,
F. Seringhaus,
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Gardiner Sherman,
Robt. Simon,
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J. R. Stanton,
James R. Steers,
Benjamin Stern,
Louis Stern,
Francis Lynde Stetson,
Lispenard Stewart,
Wm. R. Stewart,
Jos. Stickney,
James Stokes,
Mason A. Stone,
Sumner R. Stone,
George Storm,
Edward Sturges,
John S. Sutphen,
Albert Tag,
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Tozo Takayanagi,
C. A. Tatum,
Miss Alexandrina Taylor,
Stevenson Taylor,
Wm. E. Tefft,
H. L. Terrell,
Walter Thompson,
E. Titus, Jr.
William Toel,
William Toothe,
Howard Townsend,
R. H. L. Townsend,
J. Evarts Tracy,
Benjamin I. N. Trask,
Miss Susan Travers,
Mrs. J. B. Trevor,
Alfred Tuckerman,
Paul Tuckerman,
Edward P. Tysen,
E. S. Ullmann,

Miss Anna Murray Vail,
Herbert Valentine,
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Chas. H. Van Brunt,
Rev. Geo. R. Van Dewater,
E. H. Van Ingen,
Alfred Van Santvoord,
Wm. H. Van Slyck,
Edgar B. Van Winkle,
Geo. H. Vose,
Salem H. Wales,
Henry F. Walker,
Antony Wallach,
William I. Walter,
Wm. T. Wardwell,
Allan C. Washington,
John I. Waterbury,
H. Walter Webb,
S. D. Webb,
W. H. Webb,
Geo. P. Webster,
Mrs. John A. Weekes,
Camille Weidenfeld,
R. E. Westcott,
John M. E. Wetmore, M. D.
Geo. G. Wheelock, M. D.,
William E. Wheelock, M. D.
Horace White,
Stanford White,
William Wicke,
Edward A. Wickes,
G. G. Williams,
Washington Wilson,
John D. Wing,
Grenville L. Winthrop,
Robert Dudley Winthrop,
Mrs. Frank S. Witherbee,
Emil Wolff,
Mrs. Cynthia A. Wood.
John D. Wood,
F. F. Woodward,
W. H. Woolverton,
Miss Cornelia S. Wray,
Andrew C. Zabriskie,
O. F. Zollikoffer,

BOTANICAL GARDENS.*

ORIGIN AND DEVELOPMENT.

The cultivation of plants within small areas for their healing qualities by the monks of the Middle Ages appears to have been the beginning of the modern botanical garden, although these mediæval gardens doubtless took their origin from others of greater antiquity. Botanical gardens were thus primarily formed for purely utilitarian purposes, although the æsthetic study of planting and of flowers must doubtless have appealed to their owners and visitors. Their function as aids in scientific teaching and research, the one which at present furnishes the dominating reason for their existence, did not develop much, if at all, before the sixteenth century, and prior to the middle of the seventeenth century a considerable number existed in Europe in which this function was recognized to a greater or less degree, of which those at Bologna, Montpellier, Leyden, Paris and Upsala were perhaps the most noteworthy. The ornamental and decorative taste for planting had meanwhile been slowly gaining ground, as well as the desire to cultivate rare or unusual species, and during the eighteenth century attained a high degree of development. Many persons of wealth and influence fostered this taste and became, through the employment of men skilled in botany and horticulture, generous patrons of science. The world was searched for new and rare plants, which were brought home to Europe for cultivation, and many sumptuous volumes, describing and delineating them, were published, mainly through the same patronage. The older gardens were essentially private institutions, but as the rights of the people became more and more recognized, many existing establishments and an increasing number of newly founded ones became, to a greater or less extent, open to the public, either through an admit-

*Address by Vice-President Nathaniel Lord Britton, Chairman of Section G., American Association for the Advancement of Science, at Buffalo, N. Y., August, 1896.

tance fee or without charge. The four main elements of the modern botanical garden have thus been brought into it suc cessively.

1. The utilitarian or economic.
2. The æsthetic.
3. The scientific or biologic.
4. The philanthropic.

These four elements have been given different degrees of prominence, depending mainly upon local conditions, some gardens being essentially æsthetic, some mainly scientific, while in our public parks we find the philanthropic function as the underlying feature, usually accompanied by more or less of the æsthetic and scientific.

The Economic Element. In the broadest extension of this department of a botanical garden there might be included, to advantage, facilities for the display and investigation of all plants directly or indirectly useful to man, and their products. This conception would include forestry, pharmacognosy, ag- riculture, pomology, pathology and organic chemistry, and, in case the management regards bacteria as plants, bacteri- ology.

The display of the plants may be effected by growing such of them as will exist without protection in the locality in a plot, more or less individualized, commonly known as the Economic Garden, while those too tender for cultivation in the open are grown in the greenhouses, either in a separate house or sec- tion, or scattered through the several houses or sections, in the temperatures best adapted to their growth. The display of plant products, best accompanied by mounted specimens of the species yielding them, by photographs and by plates, is accomplished by the Economic Museum, where these are arranged in glass or glass-fronted cases, suitably classified and labelled. It is believed that the most useful results are obtained by arranging this museum by the products themselves, and thus not in biologic sequence, but by bringing together all drugs, all fibres, all woods, all resins; where the same product is used in more than one industry the exhibit may be duplicated, more or less modified, without disadvantage.

The investigation of economic plants and their products is accomplished through the Scientific Department, and few valuable results can be reached unless the scientific equipment is well developed. The two departments must work conjointly, both on account of the necessity of knowing just what species is under investigation, its structure, distribution and literature, and in order that the most approved and exact methods may be used in the research. Any idea that the scientific element can be dispensed with in connection with economic studies is palpably untenable.

Teaching and research in agriculture, pomology and plant pathology are so well organized in America, through our National Department of Agriculture and our numerous agricultural colleges and schools, that there is no great necessity for providing elaborate equipments for those branches in botanical gardens. But in case the endowment of a garden were sufficiently large to enable them to be successfully prosecuted, in addition to more necessary work, there can be no doubt that important additions to knowledge would be obtained. On the other hand, no such liberal allowances have been made with us for forestry or pharmacognosy, and research and instruction in these sciences must prove of the greatest benefit to the country.

The Æsthetic Element. The buildings, roads, paths and planting of a botanical garden should be constructed and arranged with reference to tasteful and decorative landscape effect. The possibilities of treatment will depend largely upon the topographical character af the area selected and the natural vegetation of the tract. The buildings required are a fire-proof structure or structures for museum, herbarium, libraries, laboratories, and offices; a glass house with compartments kept at several different temperatures for exhibition, propagation and experimentation, or several separate glass houses; and to these will be usually added dwelling-houses for some of the officers, a stable and other minor buildings. The character, number and sizes of the buildings generally depend on financial considerations. In placing the structures

intended for the visiting public, considerations of convenient access, satisfactory water supply, and the distribution of crowds must be borne in mind, in connection with the landscape design. The planting should follow, as nearly as possible, a natural treatment, except immediately around the larger buildings and at the entrances, where considerable formality is desirable for architectural reasons. It is especially desirable that as much natural treatment as possible should be given to the areas devoted to systematic planting—herbaceous grounds, fruticetum, arboretum. The rectilinear arrangement of plant beds found in most of the older gardens has become abhorent to landscape lovers, and the sequence of families desired can usually be quite as well obtained by means of curved-margined groups.

The cultivation of decorative plants, and especially the fostering of a taste for them, and the bringing of unusual or new species to attention and effecting their general introduction, are important functions of a botanical garden. For the accurate determination of these plants, information concerning their habits and structure, and suggestions regarding the condition of their growth, the æsthetic side must rely on the scientific.

The Scientific or Biologic Element. The important relations of the scientific department to the economic and æsthetic have already been alluded to. The library, herbarium, museums and laboratories are the sources whence exact information regarding the name, structure, habits, life processes and products of plants are derived, and they are the more useful as they are the more complete and thoroughly equipped. It is practically impossible for any one library to have all the literature of botany and related sciences, any one herbarium to possess an authentic and complete representation of all species of plants, or any one museum to be thoroughly illustrative; absolute perfection along these lines cannot be obtained, but the more closely it is approximated the better the results. The research work of the scientific department should be organized along all lines of botanical inquiry, including tax-

onomy, morphology, anatomy, physiology, and paleontology, and the laboratories should afford ample opportunities and equipment for their successful prosecution.

The arrangement of the areas devoted to systematic planting, and the proper labelling of the species grown, are important duties of the scientific department. The sequence of classes, orders and families is usually made to follow some "botanical system." It is highly desirable that this should be a system which indicates the natural relations of the families, as understood at the time the garden is laid out, and be elastic enough to admit of subsequent modification as more exact information relative to those relationships is obtained. The weight of present opinion is overwhelmingly in favor of an arrangement from the more simple to the more complex, and this will apply not only to the systematic plantations, but to the systematic museum and herbarium.

The scientific possibilities of a botanical garden are the greater if an organic or coöperative relationship exists between it and a university, thus affording ready facilities for information on other sciences.

The Philanthropic Element. A botanical garden operates as a valuable philanthropic agency, both directly and indirectly. Its direct influence lies through its affording an orderly arranged institution for the instruction, information and recreation of the people, and it is more efficient for these purposes than a park, as it is more completely developed and liberally maintained. Its indirect, but equally important, philanthropic operation is through the discovery and dissemination of facts concerning plants and their products, obtained through the studies of the scientific staff and by others using the scientific equipment.

NUMBER AND DISTRIBUTION OF BOTANICAL GARDENS.

There are somewhat over 200 institutions denominated botanical gardens, but only a few of them meet the requirements of the foregoing sketch. Some are essentially pleasure parks, with the plants more or less labelled; most of them pay

some attention to taxonomy and morphology, many to economic botany, while a small number are admirably equipped in all branches of the science.

I have drawn freely on Professor Penhallow's first annual report of the Montreal Botanical Garden, published in 1886, for the following approximate statement of the number in different countries:

Algeria, 1.
Australia, 5.
Austro-Hungary, 13.
Belgium, 5.
Brazil, 2.
Canada, 1.
Canary Islands, 1
Cape of Good Hope, 3.
Ceylon, 1.
Chili, 1.
China, 1.
Cochin China, 1.
Denmark, 2.
Ecuador, 1.
Egypt, 1.
France, 22.
Germany, 36.
Great Britain and Ireland, 12.
Greece, 1.
Guatemala, 1.
Guiana, 1.
Holland, 4.
India, 7.
Italy, 23.
Japan, 1.
Java, 1.
Malta, 1.
Mauritius, 1.
Natal, 1.
New Zealand, 1.
Norway, 1.
Peru, 1.
Philippine Islands, 1.
Portugal, 3.
Reunion, 1.
Roumania, 2.
Russia, 16.
Servia, 1.
Siberia, 1.
Spain, 2.
Straits Settlements, 1.
Sweden, 6.
Switzerland, 4.
Tasmania, 1.
United States, 10.
West Indies, 6.

NOTES ON SOME FOREIGN GARDENS.

1. Buitenzorg, Java. This is the largest botanical garden, occupying some 1,100 acres, at altitudes from sea level to about 6,000 feet. It was founded by the Dutch government in 1817, and has been well supported. Affording as it does highly favorable conditions for the growth of tropical and subtropical plants under natural conditions, it has yielded

most important results, especially in taxonomy and plant physiology, many of which have been published in the ten large volumes of its "Annales."

2. The Royal Botanic Gardens at Kew are situated on the south bank of the Thames, about six miles west of Hyde Park Corner. They are reached by several railway routes, the time from Charing Cross being about forty minutes, by steamer and by omnibus lines. The present area of the gardens is about 260 acres, an addition having been made during the past year. These world-famed gardens originated in the exotic garden of Lord Capel, in 1759. In 1840 they were adopted as a national establishment and opened as a public park. The botanic garden proper occupies about seventy acres and the remainder is given to arboretum and pleasure grounds. There are two main greenhouses: 1. The palm house, 362 feet long, the central dome rising 66 feet; 2. The temperate house, of which the central portion is 212 feet long, 137 feet broad and about 60 feet high, flanked by wings which give a total length of about 580 feet, the whole covering between one and one and one-half acres of ground. There are also fourteen other houses, grouped in two ranges and more or less connected, given to special collections. There are three botanical museums: 1. Devoted to economic products; 2. to miscellaneous products; 3. to timbers. There is also a large museum hall given to the exhibition of floral paintings by the late Marienne North. There is a small laboratory equipped for research in physiological botany. The herbarium and library occupy the old palace of the King of Hanover, near the main entrance to the garden, and they are the largest and most complete in the world. The herbaceous ground is planted in long parallel beds and contains several thousand species. The arboretum is thoroughly illustrative of all trees that will grow in the open at Kew, and the shrubs are, for the most part, cultivated in areas by themselves. There are numerous special features, such as the rock garden, the bamboo garden and the American garden.

The research work of Kew is principally economic and taxonomic. Around it centre the twenty-four botanical gardens and botanical stations of the British colonies, which are manned chiefly by men who have studied or worked at Kew. The principal publications at present emanating from Kew are:

1. The Kew Bulletin of Miscellaneous Information.
2. Hooker's Icones Plantarum.
3. The Continuation of Hooker's Flora of India.
4. The Continuation of the Flora of Tropical Africa.
5. Annual Reports.
6. The Index Kewensis.

The monographs and separate writings of its staff of scientific men are too numerous to review at this point.

3. The Royal Botanical Garden of Berlin is situated in the southwestern part of the city, but a project for moving it out into the country is now being seriously considered. The palm house reaches a height of about ninety feet, being the highest one yet constructed, and too high for satisfactory operation. The botanical museum is very extensive, and has series of economic, systematic and archæological collections. The herbarium is one of the largest in the world. The systematic beds are arranged on a strictly modern sequence, and portions of the garden are devoted to plant geography and plant biology. The arboretum is not extensive. Among special features may be mentioned the alpine garden and the collections of Cacti. The garden is an institute of the University, where the principal laboratories are situated. There is also an institute of plant physiology, with a small separate garden. The official publications of the Berlin Garden are the "Notizblatt" and annual reports. A series of volumes of "Jahrbücher" was issued some years ago. The publications of the garden staff are voluminous, and cover all lines of botanical inquiry.

4. The long established "Jardin des Plantes," the gardens of the Museum of Natural History at Paris, are situated in the heart of the city, fronting on the Seine. The conser-

vatories are grouped near the main museum building, at one end of the grounds, are very large, and contain a great variety of plants. The botanical library, laboratories and the enormous herbarium are in a separate older building. The systematic beds are arranged in rows; owing to the limited size of the area devoted to them they are much crowded, but contain a splendid assortment of species. But little space is given to trees; there are, however, some famous specimens. Many valuable contributions to the literature of botany along all its lines have emanated from this grand institution for over one hundred years, published for the most part in the "Annales" and "Archives" of the Museum of Natural History, and in the Bulletin of the Botanical Society of France.

5. The Botanical Garden of the University of Vienna was established about 1754, and is located in the heart of the city. There are here very important and extensive museums, herbaria and libraries, and one large fine greenhouse. The systematic plantations occupy the larger portion of the tract, and special areas are devoted to the cultivation of medicinal and other economic plants, to an arboretum of native trees, and to groups illustrating plant geography. The garden and associated laboratories provide equipment for the prosecution of all lines of botanical research.

6. The Botanical Garden of Geneva was founded in 1817, and is situated in the heart of the city near the University. There are two small greenhouses, a very large and important herbarium and library, and a small museum. The laboratories of the University are extensive and well equipped, affording capital facilities for work along all lines of botanical investigation. The De Candolle herbarium and library, and the Boissier herbarium and library, which are near by, afford, in connection with the collections of the garden, unsurpassed facilities for taxonomic study.

7. The Royal Botanic Garden of Edinburgh covers about sixty acres, of which about one-half was added to the older portion some twelve years ago; there are possibilities of still

further enlargement. The main greenhouses have a frontage of about two hundred feet, the palm house rising some seventy feet, and there are six small special houses. The botanical museum, lecture room and laboratories are in one building, the large herbarium and library in another. The systematic plantations of herbaceous species are extensive, the rock garden being an especially strong feature. The development of arboretum and fruticetum in the newer portion of the tract has made good progress. The institution is in intimate relationship with the University, nearly all the instruction in botany being given at the garden. The research work has been extensive along taxonomic, morphologic and physiologic lines.

8. The Royal Botanic Garden of Dublin, situated at Glasnevin, just without the city, was founded through the influence of the Right Honorable and Honorable Dublin Society, in 1790, was for many years supported by this Society with the aid of government grants, and was transferred to the Science and Art Department in 1877. It includes about forty acres of undulating land, bounded to the north by the small river Tolka. There are eight greenhouses, most of them rather old, but containing a valuable collection. There is a small botanical museum and herbarium. The systematic herbaceous plantations are irregularly shaped beds, arranged in a somewhat radial manner. The arboretum and fruticetum occupy about one-half of the area.

9. The Brussels Botanical Garden lies in the heart of the city and embraces not more than ten acres of land, of which about one-half is given to the arboretum. The greenhouses are large but old. There is a very extensive herbarium and library. The systematic beds are arranged as quadrants of a circle, separated by concentric and radial paths. Special areas are devoted to ornamental and economic plants. Owing to the restricted size of the area available a very dense grouping of plants is necessitated. The research work accomplished here has been mainly taxonomic. The Botanical Society of Belgium has its headquarters at the garden.

10. The Imperial Botanical Garden at St. Petersburg is in close affiliation with the Academy of Sciences and the University. There is here a famous herbarium, a large botanical library and museum, and commodious and well stocked greenhouses. The garden publishes "Acta," and many researches prosecuted there are printed in the Bulletin and Memoirs of the Imperial Academy.

11. The Royal Botanic Garden of Trinidad, situated at Port of Spain, was established in 1818, and now occupies about sixty-three acres, with some outlying plantations. There is a vast collection of tropical plants in cultivation, an extensive botanical library and herbarium, and a small laboratory. The garden publishes "Annual Reports" and "Bulletin," dealing especially with topics of economic application.

12. The Botanical Department of Jamaica, West Indies, operates extensive gardens at Kingston, smaller ones at Castleton, and the several large Cinchona plantations. The scientific collections and library are valuable. The department publishes "Annual Reports" and "Bulletin," especially devoted to economic botany.

13. McGill University, at Montreal, Quebec, carries on a small botanical garden in connection with its laboratories. The Montreal Botanic Garden, begun in 1885 on about seventy-five acres of ground in Mount Royal Park, was soon abandoned, owing to political complications.

14. Among other foreign gardens of which mention must be made, and of which a description would be interesting if our time allowed, are those at Munich, Würzburg, Tübingen, Stockholm, Copenhagen, Upsala, Zurich, Ceylon, Calcutta and Oxford.

BOTANICAL GARDENS IN THE UNITED STATES.

The first botanical garden established in America was begun by John Bartram in Philadelphia, in 1728. In it he placed a considerable number of plants obtained in the course of his extensive travels. The plot still remains, including the family homestead, somewhat modified, and it is a pleasure to know that it will be preserved as public ground.

André Michaux, in the latter part of the last century, planted gardens at Charleston, S. C., and New Durham, N. J., but they were essentially nurseries from which he sent seeds and plants to Europe.

In the year 1801 Dr. David Hosack, then Professor of Botany and Materia Medica in Columbia College, purchased twenty acres of ground in New York City, and called it the Elgin Botanic Garden; in this tract he accumulated, with great labor, during the next ten years, a very large and valuable collection of plants. The institution was transferred to the State of New York, through an Act of the Legislature, in 1810, and was then known as the Botanic Garden of the State of New York. It was subsequently granted to Columbia College. Funds for its maintenance were not provided, however, and it was ultimately abandoned, Two catalogues of its plants were issued by Dr. Hosack, one in 1806, and another in 1811. The condition of botanical gardens in America at that time is indicated by the following note in Dr. Hosack's cataloge of 1806:

" I learn, with pleasure, that a Botanic Garden is proposed to be established near Boston, and connected with the University of Cambridge. The Legislature of Massachusetts, with a munificence which does them honor, have granted, for this purpose, a tract of land, the value of which is estimated at thirty thousand dollars; and several individuals have evinced their liberality and love of science by voluntary subscriptions, to the amount of fifteen thousand dollars, towards the establishment and support of that institution. Another is also begun at Charleston, S. C., and a third is contemplated in New Jersey, in connection with the College of Princeton."

In the year 1824 there was published at Lexington, Ky., the " First Catalogues and Circulars of the Botanical Garden of Transylvania University at Lexington, Ky., for the year 1824," by W. H. Richardson, M. D., President of the Board of Managers, and C. S. Rafinesque, Ph.D., Secretary. This rare pamphlet, which is not recorded in Dr. Call's very

complete life and writings of Rafinesque, is of twenty-four pages, and is printed alternately in English and French. It is essentially an appeal for plants and material for the garden, and a list of species that it could furnish to kindred institutions. This garden was evidently short-lived, inasmuch as in Rafinesque's "Neogenyton" of the following year, 1825, he remarks, "I mean, therefore, to indicate and propose, in this small essay, many of the numerous new genera of plants detected or ascertained, some of which were indicated last year, 1824, in the Catalogue of the botanical garden which I have tried in vain to establish in Lexington."

The principal gardens at present operated and in course of development in the United States are as follows:

1. The Botanic Garden of Harvard University, at Cambridge, Mass., founded in 1805. There are about seven acres of land under cultivation, a small greenhouse, and a famous herbarium and library, from which have flowed during the past forty years voluminous and invaluable contributions to taxonomy and morphology, especially of North American plants. There is also a small morphologic laboratory. The main laboratories and museums connected with the institution are situated in other of the Harvard buildings, a short distance away. The system of garden, libraries, museum, laboratories and herbaria operated by Harvard College is one of the most complete in existence. It is hard to say, indeed, in what respect it is not ideal, except in the rather wide distance separating the several elements, and the small amount of land available for planting.

2. The Arnold Arboretum of Harvard University, at Jamaica Plain, Mass., was founded through a bequest of $100,000, made about 1870, by Mr. James Arnold, of Providence, R. I., to three trustees, to be used for the improvement of agriculture or horticulture. The trustees wisely determined to devote it to forestry and dendrology, and effected coöperative agreements with Harvard College and the City of Boston, which have now given us the greatest tree museum in existence, freely open to the visiting public. The planted

area is about one hundred and sixty acres, and will be materially increased in size. A small museum, library and herbarium building has been erected near the main entrance. The great "Silva of North America" and the journal "Garden and Forest" are noteworthy publications from this noble institution.

3. The Botanic Gardens of the United States Department of Agriculture, at Washington, have an extensive range of greenhouses and a large tract of land under cultivation. The herbarium of the department, now deposited with the United States National Museum, is very large, and is at present increasing more rapidly than any other in America. There is a somewhat effective working library, which greatly needs material enlargement, and several poorly located and equipped laboratories, in which a vast amount of important investigation is being accomplished, under very unfavorable conditions, which urgently demand improvement. Publications include: Bulletin of the Botanical Division, Bulletin of the Division of Forestry, Bulletin of the Division of Plant Pathology and Physiology, Contributions from the United States National Herbarium, Year-Book of the United States Department of Agriculture, and circulars of the several divisions.

4. The Missouri Botanical Garden, at St. Louis, Mo., was established in 1889, through the provisions of the will of Mr. Henry Shaw, who for over thirty years previously had been bringing together material for it on the land about his residence, which was known as Shaw's Garden. There were in all some six hundred and seventy acres devised to the institution under the will of the generous and philanthropic founder, and from the income yielded by much of this land, not nearly all the area being required for garden purposes, the institution derives its large maintenance fund, which will certainly be greatly increased as the land becomes more valuable, and will supply an income sufficient to operate the institution in the most effective manner. There are several greenhouses, a very large and valuable herbarium and li-

brary, while the laboratories of the Shaw School of Botany, at Washington University, are in close relationship to the garden. Much important research, principally taxonomy, has been prosecuted. Publications consist of seven volumes of Annual Reports and nine "Contributions from the Shaw School of Botany."

5. The Botanical Garden of the Michigan Agricultural College was begun in 1877. There are now about three acres under high cultivation, exclusive of the arboretum and decorative grounds, which together cover several acres. There are several small greenhouses, an herbarium of about sixty thousand specimens, a good botanical library, and extensive, well equipped laboratories.

6. The University of California, at Berkeley, has a botanical garden of several acres, established some years ago, in which a large number of plants are grown. It furnishes a valuable adjunct to the work of the botanical department, which has well appointed laboratories, a working library, and a large herbarium.

7. The University of Pennsylvania has recently established a garden of about three acres in the immediate vicinity of its building in Philadelphia, and has many species under cultivation. The extensive and well appointed laboratories of its School of Biology, good library facilities and a small herbarium afford capital opportunity for research, especially in physiology and morphology.

8. Smith College, at Northampton, Mass., has also recently established a botanical garden on the campus.

9. The Buffalo Botanical Garden, in South Park, Buffalo, N. Y., was commenced in 1893, and has since made rapid and encouraging progress. A small range of greenhouses has been built, and others are planned. A beginning has been made in accumulating a library and herbarium, and much permanent planting has been accomplished.

10. The New York Botanical Garden. The establishment of the New York Botanical Garden was authorized by the Legislature in 1891, and the enabling act was amended in

1894. The enterprise was inaugurated and the legislation procured by a committee of the Torrey Botanical Club, appointed in 1889. The act of incorporation provided that, when the corporation created should have raised or secured by subscription a sum not less than $250,000, the Commissioners of Public Parks were authorized to set apart and appropriate a portion of one of the public parks, not exceeding two hundred and fifty acres, and the Board of Estimate and Apportionment was authorized to issue bonds, aggregating the sum of $500,000, for the construction and equipment, within the grounds, of the necessary buildings. The subscription of $250,000 required by the Act of Incorporation was completed in June, 1895, and the Commissioners of Public Parks, in the following month, formally appropriated two hundred and fifty acres of the northern part of Bronx Park for the purposes of the Garden. Since that time the preparation of plans for the development of the tract has been steadily progressing, including designs for the museum building and a large horticultural house. This planning is still in progress, in charge of a commission of architects, engineers, gardeners and botanists, who will complete their work within a short time and be ready to submit a complete scheme to the Board of Managers during the coming autumn. Meanwhile, much preliminary work has been accomplished in clearing the ground, in grading, in the planting of borders, in the establishment of an extensive nursery, and in the accumulation of herbarium, museum and library material. Through a co-operative agreement entered into with Columbia University, the herbarium and botanical library of the University will be deposited with the Garden, and most of the research and graduate work of the University in botany will be carried on in the Museum Building.

The endowment fund has been materially increased, and about four hundred and thirty persons have become annual members of the Garden, contributing ten dollars a year each to its support. The publication of a Bulletin has been commenced by the issue, in April, of the first number of Volume I.

THE GLACIAL OR POST-GLACIAL DIVERSION OF THE BRONX RIVER FROM ITS OLD CHANNEL.

By J. F. Kemp.

As one of the Scientific Directors of the recently organized New York Botanical Garden, the writer has had frequent occasion to visit Bronx Park in the last two years. In one of the earliest of these visits the anomalous relations of the Bronx River to what is its natural line of drainage were noted, and in subsequent ones attempts have been made, not, it must be admitted, with altogether satisfactory results, to explain the present channel. The facts are briefly as follows:

The Bronx River takes its rise a few miles above White Plains and flows southward for thirty miles into the western extremity of Long Island Sound. For much the greater part of its course, it occupies a valley, excavated in a belt of crystalline dolomite that is almost continuous to the salt water. The valley is similar to the usual type of valley in Westchester County, and doubtless owes its depressed character to the easy erosion of the dolomite. The depression is used by the Harlem Railroad from a point just below Morrisania, northward until it crosses into the drainage basin of the Croton River. The Bronx, however, at a point a half a mile or so below Williamsbridge, and just above Bedford Park Station, and in the upper portion of the area assigned to the Botanical Garden, abruptly leaves its old valley and breaks across the enclosing ridge of gneiss, in a gorge 75 feet deep. For nearly a mile it occupies this gorge and then reaching more open country, with a rocky fall at Bronxdale and another at West Farms, it makes its way to the sound.

Just below Williamsbridge it flows against the west side of the valley, and immediately alongside of the railroad. It then leaves this and passes diagonally to the south, being diverted in part by a broad and flat terrace of coarse, rounded, cobble stones, up to one foot or more in diameter and with comparatively little sand intermingled. The cobbles have

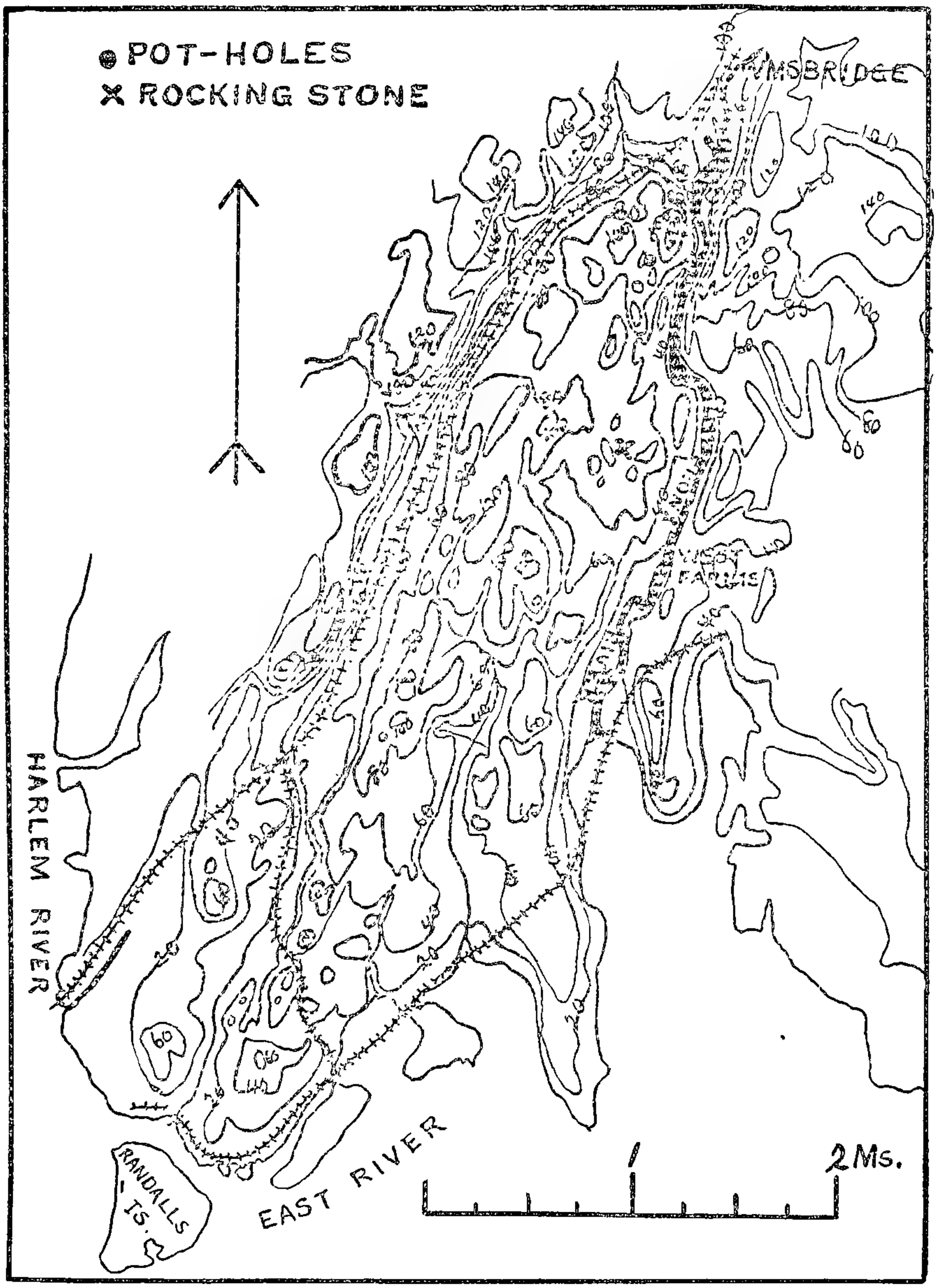
been exposed for a thickness of at least 20 feet, by the excavations, for the new Williamsbridge sewer. The river passes along the foot of the ridge on the east side and divides the gravel terrace in two, so as to leave a small remnant on the eastern gneisses. It then runs against a westerly spur of the ridge and cuts through it, in a pronounced gorge, diagonally across the foliation of the rock, which is a hard micaceous gneiss.

From the entrance to the gorge a swampy depression extends westward to the railroad and has all the characteristics of an abandoned channel. The railroad has crossed it by an embankment and culvert. Just east of the culvert there is gneiss but a few feet below the soil, and at this point the old stream evidently surmounted a reef. The depression continues southward just west of the track, as far as Morrisania; it is then crossed by the track, which, traversing a low divide into the next limestone valley to the west, follows this to Mott Haven, and then passes over the river to Manhattan Island. The depression runs south from Morrisania and enters the East River opposite Randall's Island. In all its extent there is no natural barrier, although many streets have been filled in across it. At its highest point, near Bedford Park Station, it is not more than ten or twelve feet above the present surface of the Bronx River at the gorge, probably less. The river is about five feet deep at this point. All these relations are shown on the accompanying map, which is reproduced from the Harlem sheet of the United States Geological Survey. The excess of streets and railways on the original map mask the contours, which can only be traced on it with difficulty. Accordingly everything but the contours, the river and one or two railway lines have been omitted in redrawing, and for the same reason no attempt has been made to put in the geology. The authorities of the Botanical Garden have a map of its area on a very large scale and with five foot contours. The writer has used this also in the preparation of the paper, although all the material points are well illustrated on the smaller scale.

By observing the map it will be seen that both the river

and the old channel are below the 60-feet contour just south of Williamsbridge. The terrace of cobblestones is well shown at this point by the projecting 60-feet contour, just under the number 60. The location of the upper part of the old channel where the little brook comes into the Bronx is also shown, and the present almost unrecognizable divide may be identified between it and the brook that flows south into the East River along the old channel. This latter brook is now practically obliterated by street improvements. It cuts the 40-feet contour about a mile and a half south of Williamsbridge, and the 20-feet contour three miles south of the same point. The Bronx, however, passing into the gorge, crosses the 40-feet contour a quarter of a mile from the entrance and the 20-feet contour at West Farms. The new route to salt water is shorter than the old by some two miles, being three as against five, and therefore the fall of 50 feet is the more accentuated under present conditions.

The gorge is somewhat open at its upper end, but it soon closes in and has steep and jagged walls. Some 65 to 75 feet from the bridge at its entrance, and on the west bank, is one of the two potholes, which were described by Dr. N. L. Britton in the *Transactions of the New York Academy*, Vol. I., p. 181, 1881. It is broken down on the outer side, as is usual with potholes below which the creating stream has cut. The inner half remains, however, and is about 12 feet deep. The bottom of the bowl is quite perfect and shows that the hole must have been 5 or 6 feet in diameter. The bottom is, by aneroid, about 25 feet above the river surface. The walls are still smooth and scarcely decayed at all. A few paces up the hillside to the southeast is another, that is even more impressive. This is only about 5 or 6 feet deep, but much more of it remains than of the lower one. It is 6 feet 2 inches in diameter, and contains a large rounded bowlder, 4 feet by 3 feet by 2 feet 6 inches. A tree a foot in diameter sprouts out from beneath the bowlder. This pothole is 30 feet above the lower one and therefore over 50 feet above the river. Back of it, the hill rises at its summit some 20 feet higher. About



Map of the Lower Bronx River. Based on the Harlem Sheet, U. S. Geological Survey.

a half mile east of south of these potholes is another smaller but very perfect one, on the eastern edge of the rocky ledge and on the 100-feet contour. It is a foot in diameter or less and about 2 feet deep. All three of these potholes are shown on the map by round dots. The last named one indicates that rapid and extensive currents must have flowed for a time even over the high ground.

The fresh condition of these potholes seems to indicate that the lapse of time since they were formed has not been geologically great. It does not appear that they can be as old as the Tertiary, but rather that they were formed in Glacial times, or in the times immediately following. Additional ones at West Farms are recorded in Dr. Britton's paper above referred to.

That the Bronx has been diverted, therefore, from a southwesterly course and from a natural drainage valley which is parallel with the strike of the country rock, and that it has cut across a ridge about 50 to 60 feet above its old channel and has assumed a course nearly due south, at an angle of about 40 degrees to the foliation of the gneiss, and that all this has happened in rather recent geologic times, there is no doubt. But when a diverting cause is sought, it is not easy to find. A gravel bar or a morainal deposit in the old channel somewhere between Bedford Park Station and tide water was first thought of as the most probable cause. But exploration along the line of the old depression failed to show one. It is true that the brook shown on the map headed just above Fordham and flowed in the depression before street and railway improvements masked it, but, even if it had eroded in large part a supposed gravel barrier, some traces of the latter should remain. Observation of the valley failed to reveal such and the topographical maps do not suggest them.

A second hypothesis assumed that the present gorge was an old depression from an earlier drainage period, which perhaps a temporary stoppage of the old channel by the ice sheet had caused the river to clear of possible gravel, etc. But the presence of the potholes militates against this view and indi-

cates a rapid stream flowing over rocky ledges, and heavily charged with grit.

A third hypothesis, and one that appears to be the most reasonable, is that during the presence of the ice sheet, a sub-glacial, or perhaps in part a supra-glacial stream down the upper valley of the Bronx found its way out over this ridge and began to cut it down; being prevented issuing by the old channel because of the presence of the ice. The objections to this are the brevity of the time allowed by these conditions for excavating a gorge 60–70 feet deep. The hilltops about the gorge are glaciated, as, indeed, is the surface of the country very generally in this vicinity. A lobe of entirely stagnant ice in the old channel as a diverting cause is regarded as an almost too temporary affair. The terrace of cobble stones is assuredly connected with the great floods of the ice period in some way and with very copious and swift waters, as their size indicates.

Finally, it may be suggested, as a fourth hypothesis, that the present channel has always been the drainage line of the Bronx, to which it has consistently adhered, while the westerly depression has been caused by the small stream now occupying it; and that the brook has excavated this valley at a little slower rate than the Bronx has its present one. But when one sees the size of the west depression and the insignificance of the present stream it is clearly impossible that such could have been the case.

It will at once occur to all who are familiar with the problems involved in the river drainage of the State of Connecticut* that both the Housatonic and the Connecticut rivers have left what appear to be their natural channels and have turned eastward through ridges of gneiss, but the diversion of the Bronx, with its 50 or 60 feet of gorge and its potholes, is not a phenomenon of the same magnitude with that of the Connecticut, the bottom of whose gorge lies four huudred feet

* See in this connection W. M. Davis, Topographic Development of the Triassic Formation of the Connecticut Valley, *Amer. Jour. Sci.*, June, 1889, 423. H. B. Kümmel, Some Rivers of Connecticut, *Journal of Geology*, Vol. I., 371, 1893.

below the old Cretaceous peneplain. The earlier valley of the Bronx doubtless represents its Tertiary erosion in the Cretaceous peneplain of Westchester County, while the gorge is of Glacial and Post-glacial development.

The portion of the geological history of the Bronx, therefore, that is discussed in this paper is so recent that it has not been felt to be necessary or appropriate to review the general production of the Cretaceous peneplain, whose stumps now form our singularly even hilltops and horizon line, but in the paper cited below its development will be found fully set forth.* The recent geologic history of the neighboring coast has a more direct bearing. As regards Long Island Sound, Professor Dana† has supplied some very important points in the record. It is altogether probable that Long Island Sound was a river valley during a part at least of the Glacial Period, certainly before the ice covered it and built up the Long Island moraines. A well marked channel is still shown by soundings along the north shore of Long Island, and it is necessary to assume an elevation of 100 feet above its present position in order to account for these conditions. Other channels are also indicated, now, of course, drowned out by the Sound and choked up as regards some of their old outlets by drift.

A few months after the publication of Professor Dana's paper, Dr. F. J. H. Merrill‡ recorded and interpreted evidence that indicates for the neighboring Hudson Valley ups and downs that of course the Bronx must have shared. Dr. Merrill states that, after the retreat of the continental glacier from this section, the land stood for a long time at a minimum depression of 80 feet below its present level. A gradual ele-

*W. M. Davis, The Geological Dates of Origin of certain Topographic Forms on the Atlantic Slope of the United States, *Bulletin Geological Society of America*, II., 545, 1891.

†J. D. Dana, Long Island Sound in the Quaternary Era, with Observations on the Submarine Hudson River Channel, *Amer. Jour. Sci.*, December, 1890, p. 425. See also John Bryson, *Amer. Geol.*, November, 1896, p. 329.

‡F. J. H. Merrill, Post-glacial History of the Hudson River Valley, *Amer. Jour. Sci.*, June, 1891, p. 460.

vation followed to a point about 180 feet above its present position. During this elevation erosion must have been especially active. Depression followed of about 100 feet, bringing the level down to its present position. The same sinking is still slowly progressing. All these changes must have affected the Bronx, although they do not modify the main contention set forth above regarding the diversion.

Attention may be drawn to the rocking stone near the southern border of Bronx Park, and at the spot shown on the map. It is a fine specimen of its kind. It is about 10 feet wide by 8 feet thick by 7 to 8 feet high and may be rocked so that its North pole swings through about 3 inches of arc.

GENERAL PLAN
—OF—
THE NEW YORK BOTANICAL GARDEN

PREPARED BY THE
COMMISSION APPOINTED BY THE BOARD OF MANAGERS
JUNE 17TH 1896.

SCALE OF FEET

JOHN T. BRINLEY, CIVIL AND LANDSCAPE ENGINEER.

PLANS COMMISSION

H. A. BRITTON,
N. L. BRITTON,
JOHN K. SMALL,
LEWIS M. HASTINGS,
SAMUEL PARSONS,
JOSEPH PAXTON,

LORILLARD MANSION

BRONX PARK

BRONX RIVER

HEMLOCK

TAXUS

TORREYA

SEQUOIA

TAXODIUM

CHAMAECYPARIS

CRYPTOMERIA

ROCKERY

GLACIAL BOULDER

ROSACEÆ

MAGNOLIACEÆ

NUTACEÆ

DRUPACEÆ

DECIDUOUS

ECONOMIC GARDEN

FAGACEÆ

POMACEÆ

MORACEÆ

ARBORETUM

PLATANACEÆ

HAMAMELIDACEÆ

ULMACEÆ

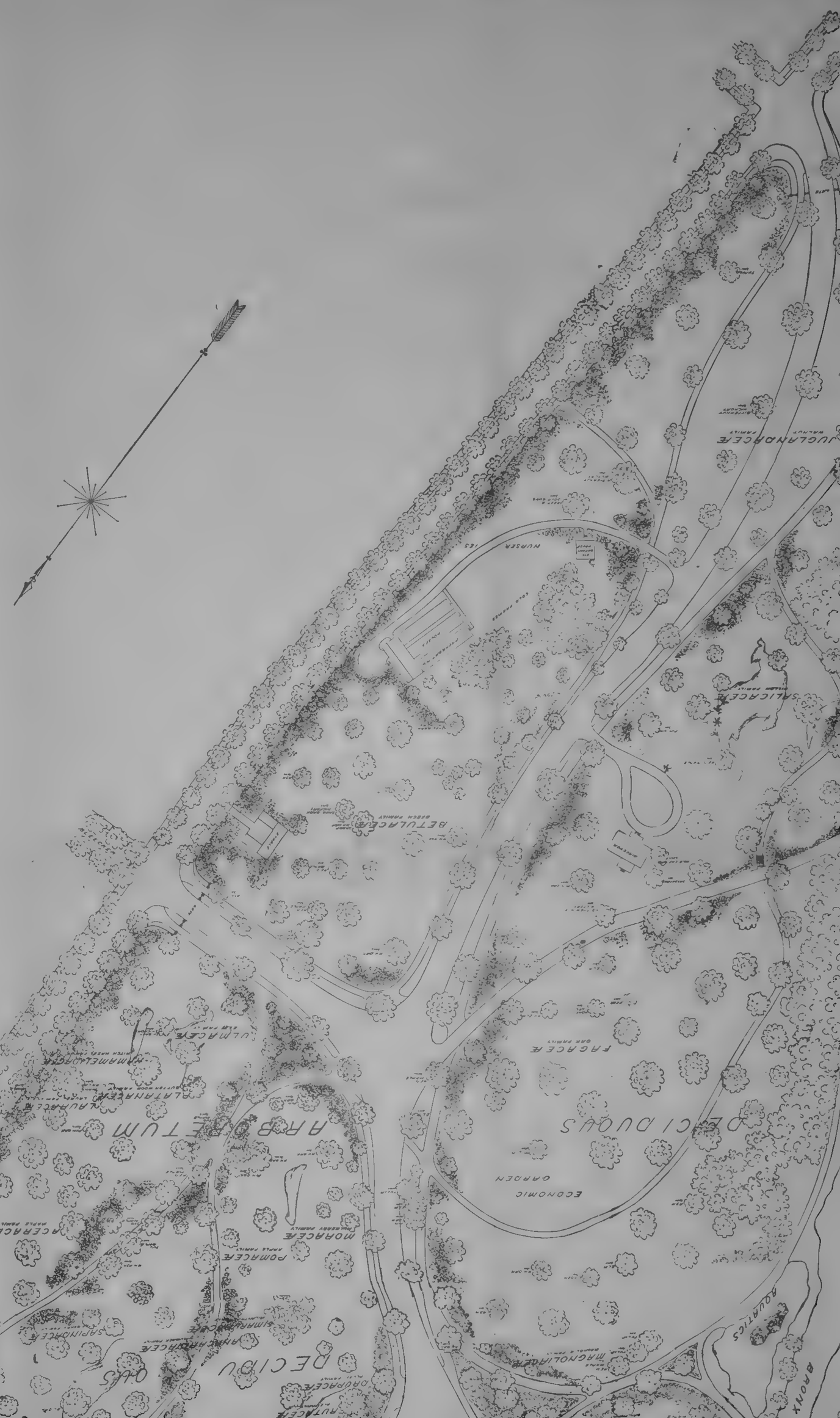
BETULACEÆ

SALICACEÆ

JUGLANDACEÆ
WALNUT FAMILY

NURSERY BEDS

GATE


JUGLANDACEÆ
WALNUT FAMILY
NURSERY
SALICACEÆ
WILLOW FAMILY
BETULACEÆ
BIRCH FAMILY
FAGACEÆ
OAK FAMILY
DECIDUOUS
ECONOMIC
GARDEN
AQUATICS
MAGNOLIACEÆ
ARBORETUM
ULMACEÆ
PLATANACEÆ
MORACEÆ
MULBERRY FAMILY
POMACEÆ
APPLE FAMILY
ROSACEÆ
ROSE FAMILY
SAPINDACEÆ
HORSE CHESTNUT FAMILY
ACERACEÆ
MAPLE FAMILY
OAKS
DECIDU
RUTACEÆ
ORANGE FAMILY
BRONX

N. Y. C. and H. R. R. R.

HARLEM DIVISION

SOUTH AVENUE ENT.

BOG GARDEN

FRUTICETUM

LAKE

FRUTICETUM

BOG

RIVER

MEADOW

APPROACH

HEWELL AVE

BIGNONIACEÆ

BRONX RIVER

STYRACACEÆ
STYRAX FAMILY

ERICACEÆ

CORNACEÆ

OLEACEÆ
OLIVE FAMILY

FORREST

RIVER

ARALIACEÆ

ELEAGNACEÆ

TILIACEÆ

ETUM

PARTHENOCISSUS

CAESALPINIACEÆ

AQUIFOLIACEÆ

HIPPOCASTANACEÆ

ARBO

AQUATICS

FAGACEÆ

BRONX

AUTACEÆ

DRUPACEÆ

DECIDU OUS

AQUATICS

MAGNOLIACEÆ
MAGNOLIA FAMILY

ANACARDIACEÆ
SUMACH FAMILY

SIMARUBACEÆ

SAPINDACEÆ

POMACEÆ
APPLE FAMILY

MORACEÆ
MULBERRY FAMILY

ACERACEÆ
MAPLE FAMILY

ECONOMIC GARDEN

DECIDUOUS

ARBORETUM

FAGACEÆ
OAK FAMILY

PLATANACEÆ
BUTTON WOOD FAMILY

LAURACEÆ

HAMAMELIDACEÆ
WITCH HAZEL FAMILY

ULMACEÆ
ELM FAMILY

MOSHOLU PARKWAY

HARLEM RIVISION

N. Y. C. AND H. R. R. R.

HARLEM

PSEUDOLARIX

PICEA

ABIES

LARIX

TSUGA

RHODOTSUGA

BOULEVARD

PINUS

THUJA

ABIES

PINETUM

SPACE PROVIDED FOR FUTURE GREEN HOUSE

SOUTHERN

THUYOPSIS

JUNIPERUS

LIBOCEDRUS

SCIADOPITYS

SEQUOIA

TAXUS

TAXODIUM

CHAMAECYPARIS

CRYPTOMERIA

ROCKY PARK

MUSEUM BUILDING

LAKE

FRUTICETUM

BOG

FRUTICETUM

FIRST HORTICULTURAL HOUSE

AQUATICS

AQUATICS

VITICETUM

HEMLOCK GROVE

BRONX RIVER

AQUATICS

FAGACEÆ

MAGNOLIACEÆ

FOREST

RIVER

LABURNEÆ

CAESALPINIACEÆ

MUTACEÆ

DRUPACEÆ

DECIDUOUS

SAPINDACEÆ

POMACEÆ

MORACEÆ

ECONOMIC GARDEN

DECIDUOUS

FAGACEÆ

ARBORETUM

PLATANACEÆ

JUGLANDACEÆ

QUERCINEÆ

VOL. I. NO. 3.

BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN.

CONTENTS:

REPORT OF THE COMMITTEE ON PLANS, SUBMITTED AND ACCEPTED JANUARY 10, 1898, ... 87
REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND ANNUAL MEMBERS, SUBMITTED AND ACCEPTED JANUARY 10, 1898, . . 98
LIST OF ANNUAL MEMBERS, JANUARY 10, 1898, . 98
REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR 1896, . 106
REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR 1897, . 122
LIST OF PLANTS IN GROUNDS AND TEMPORARY GREENHOUSE, 1897, 137
CONDENSED FINANCIAL STATEMENT, JUNE 20, 1895, TO JANUARY 10, 1898, ... 162
DESCRIPTION OF THE RANGE OF HORTICULTURAL HOUSES, WITH ILLUSTRATION, ... 164
DESCRIPTION OF THE MUSEUM BUILDING, WITH ILLUSTRATION, . 167
MAP OF BRONX PARK, SHOWING BOTANICAL GARDEN GROUNDS AND SITE APPROPRIATED FOR THE NEW YORK ZOÖLOGICAL PARK, .

[ISSUED, FEBRUARY 15, 1898.]

OFFICERS, 1898.

PRESIDENT—D. O. MILLS,

VICE-PRESIDENT—ANDREW CARNEGIE,

TREASURER—J. PIERPONT MORGAN,

SECRETARY—N. L. BRITTON.

BOARD OF MANAGERS.

1. ELECTED MANAGERS.

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CHARLES F. COX,
W. BAYARD CUTTING,
CHARLES P. DALY,
WILLIAM E. DODGE,
JOHN I. KANE,
D. O. MILLS,
J. PIERPONT MORGAN,
JAMES A. SCRYMSER,
SAMUEL SLOAN,
CORNELIUS VANDERBILT.

2. EX-OFFICIO MANAGERS.

THE PRESIDENT OF THE DEPARTMENT OF PUBLIC PARKS,
HON. GEO. C. CLAUSEN.

THE MAYOR OF THE CITY OF NEW YORK,
HON. R. A. VAN WYCK.

3. SCIENTIFIC DIRECTORS.

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C. F. CHANDLER,
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L. M. UNDERWOOD.

DIRECTOR-IN-CHIEF.

N. L. BRITTON.

BULLETIN

OF

The New York Botanical Garden

Vol. I. No. 3.

REPORT OF THE COMMITTEE ON PLANS.

(Submitted and accepted January 10, 1898.)

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen: Your Committee on Plans, appointed June 18, 1895, would respectfully submit the following report:

At the time of the Annual Meeting, held January 11, 1897, the General Plan of the Garden had already been submitted to the Board of Managers and approved by them, subject to such changes as may hereafter be found necessary. At that annual meeting your Board adopted the following resolutions:

Resolved, That the plans and specifications, prepared by Mr. R. W. Gibson, architect for the museum building, power house, stable, Director's house, head gardener's house, second gardener's house and closet, are hereby accepted and adopted, and the Secretary be and he is hereby instructed to transmit said plans and specifications, with a copy of this resolution, to the Commissioners of Public Parks for their approval, in accordance with Chapter 285, Laws of 1891, as amended by Chapter 103, Laws of 1894 and Chapter 717, Laws of 1896.

Resolved, That the Committee on Plans is hereby authorized to transmit the drawings and specifications for the greenhouses now in preparation by the Lord & Burnham Company

as soon as they are completed and approved by the Committee to the Commissioners of Public Parks.

On January 20, 1897, the plans for the buildings, designed by Mr. Gibson, were formally transmitted to the Commissioners of Public Parks, as well as a copy of the General Plan, previously adopted by your Board. On March 22, 1897, the plans for the first horticultural house and propagating houses, prepared by the Lord & Burnham Company, architects, were accepted and adopted by the Committee on Plans, subject to any needed modifications in detail and ordered transmitted to the Commissioners of Public Parks and they were so transmitted on March 31st. On May 27, 1897, the Secretary was advised by the President of the Commissioners of Public Parks that a special committee, whose opinion had been requested by the Department of Parks, did not approve of the site of the buildings and that the Commissioners deemed it wise and expedient that a meeting should be held with that Committee, with a view of coming to an agreement as to the site of the buildings at as early a date as possible.

At a meeting of the Committee on Plans, held May 28, 1897, the following letter was adopted and ordered to be transmitted by the Chairman to the President of the Board of Parks:

Dear Sir:

We accept with pleasure the invitation contained in your favor of the 27st inst. to meet your special committee with a view, as you suggest, of coming to an agreement as to the site of the proposed buildings.

The importance of prompt action is great, as otherwise the entire season may be lost. We therefore hope that an early date may be fixed by you for the meeting at your office, and we trust that the members of the Park Board may be present.

Yours respectfully, etc.,

The Commissioners of Parks arranged to meet your Committee on Plans on June 7th, but the meeting was postponed until June 10th, at which time the report of the Park Board's special Committee was read, and it was resolved that the

conference adjourn to visit the grounds of the Garden on June 12th.

The meeting at the grounds on June 12th was duly held, and the position of the buildings was discussed. Commissioner McMillan, of the Park Board, suggested changing the location of the first horticultural house, and requested the Director-in-Chief to attend a meeting of the Park Board on June 14th.

At the meeting on June 14th the Park Commissioners informally offered to vote for the approval of the plans as presented, if the site of the first horticultural house was changed either to the region between the Southern Boulevard and the road running southeast from Bedford Park station, or to the area between the Southern Boulevard and St. John's College property.

A meeting of the Committee on Plans was held to consider this proposition on June 18th, and the following resolutions were adopted:

Resolved, That the Committee on Plans of the New York Botanical Garden consent to the proposition made by individual members of the Park Board to change the site of the first horticultural house to a position south of the Southern Boulevard.

Resolved, That in the opinion of the Committee it is desirable, in the event of such change, that the Southern Boulevard be moved from its present position to a line along the boundary line of St. John's College property, leaving the railroad crossing of the Southern Boulevard where it is now placed.

Immediately upon the adjournment of this meeting the Committee on Plans held a conference with the Park Commissioners and submitted a modified plan, showing the first horticultural house moved to a position south of the Southern Boulevard, and the power house to a position along the New York and Harlem railroad, south of the Southern Boulevard. On the request of Col. Cruger, of the Park Commissioners, it was agreed to withdraw for future consideration the plans

for the Director's and the gardeners' houses, and to submit the plan thus revised to the Park Commissioners on June 21, 1897.

At the meeting of the Commissioners of Parks, held June 21st, the following resolution was adopted:

Resolved, That the plans now before this Board, as prepared and submitted by the Board of Managers of the New York Botanical Garden, showing proposed buildings to be erected on the grounds allotted for the use of the New York Botanical Garden in Bronx Park, be and the same hereby are approved, reserving the right, however, to determine as to a driveway entrance at Scott Avenue, and the width thereof.

At a meeting of the Park Commissioners, held July 19, 1897, the following resolutions were adopted:

Resolved, That the Board of Estimate and Apportionment be, and hereby is, respectfully requested to authorize the Comptroller to issue bonds to the amount of Five Hundred Thousand Dollars ($500,000), in the manner provided by Chapter 285 of the Laws of 1891 as amended by Chapter 717 of the Laws of 1896, in such sums as may be from time to time required for the purpose of erecting Museum and other buildings on the lands allotted for the use of the New York Botanical Garden in Bronx Park.

Resolved, That the plans, specifications and forms of contract this day received for the erection of a Museum Building, power house, stable, closet group and greenhouses in Bronx Park for the purpose of the New York Botanical Garden be approved, and the specifications and form of contract ordered printed, and when printed and approved as to form by the Council to the Corporation, and funds shall be available therefor, that an advertisement be inserted in "The City Record" inviting proposals for doing the work.

Resolved, That the selection by the Board of Managers of the New York Botanical Garden of R. W. Gibson and Lord & Burnham Company as architects of buildings to be erected on the grounds set apart for the use of said Garden in Bronx Park, be and hereby is approved, and that the compensation

of said architects be and hereby is fixed at 5% of the cost of the several works upon which they may be respectively employed.

The Board of Estimate and Apportionment at a public meeting held on September 29, 1897, after hearing objections, unanimously adopted the following resolutions:

Resolved, That the resolution of this Board, adopted October 30, 1895, authorizing the issue of bonds to the amount of Twenty-five Thousand Dollars ($25,000) for the Botanical Museum, Herbarium, etc., provided for by Chapter 285 of the Laws of 1891 be and the same hereby is rescinded, and

Resolved, That pursuant to the provisions of Chapter 285 of the Laws of 1891, as amended by Chapter 103 of the Laws of 1894 and Chapter 717 of the Laws of 1896, the Comptroller be and is hereby authorized to issue bonds in the name of the Mayor, Aldermen and Commonalty of the City of New York, to be known as the "Consolidated Stock of the City of New York" as provided by section 132 of the New York City Consolidation Act of 1882, to an amount not exceeding Five Hundred Thousand Dollars ($500,000) redeemable within such period as the Comptroller may determine, but not more than thirty (30) years from the date of issue and bearing interest at a rate not exceeding three and one-half (3½) per cent. per annum, the proceeds of which bonds shall be applied to defray the expenses of constructing and equipping a suitable fire-proof building for a Botanical Museum and Herbarium with lecture rooms and laboratories for instruction, together with other suitable buildings for the care and cultivation of plants and the expenses necessarily incident thereto, as provided for in said Acts.

The specifications for the buildings designed by Mr. Gibson having already been printed and approved as to form by the Corporation Council, the Commissioners of Parks advertised for proposals for their erection in "The City Record," on the day following the authorization of bonds by the Board of Estimate and Apportionment, and on October 18th received proposals from twelve different contractors, the lowest,

$354,000.00, from John H. Parker Company. The bid of this firm having been referred by the Park Board to the Corporation Council for his opinion as to its formality was pronounced by him informal and invalid, and on November 15th the Park Commissioners ordered the matter readvertised. On November 29th proposals were received from seven contractors. That of the John H. Parker Company for $347,019.00 being again the lowest, the contract for the erection of the buildings designed by Mr. Gibson was, on December 6th, awarded to the John H. Parker Company for the amount of their bid.

On December 28th the Secretary of the Committee was informed by Mr. McMillan, President of the Park Board, that the contract had been duly signed.

On December 31, 1897, President McMillan of the Department of Parks, in the presence of representatives of the enterprise and of the architects, the contractors and others, formally broke ground for the Museum Building with the following remarks:

"As President of the Department of Public Parks, I now propose to break ground for the Botanical Museum that will soon adorn this beautiful spot. A great and progressive metropolis like ours has need of this noble structure; it has need of its example and of the splendid educational influences that will radiate from these walls.

"I pray that success may attend this enterprise and that the last day of the year 1897 may become forever memorable by reason of the work which has called us together."

The specifications for the range of horticultural houses (first horticultural house) were sent by the Park Commissioners to the Public Printer on December 3d, and proof of them was received on December 15th, corrected by the architects, and transmitted to the Corporation Council on December 16th. These specifications were returned by the Corporation Council to the Park Board on December 24th, approved as to form, and were transmitted to the Public Printer for final printing. On December 27th a set of these plans was filed by the Lord

& Burnham Company, architects, at the office of the Building Department, which on December 30th approved the plans, and issued the necessary permit for the erection of the building.

From the Mayor's message of January 1, 1898, it appears that City bonds to the amount of One Hundred and Twenty-five Thousand Dollars ($125,000) have been issued towards the erection of the Museum Building.

During the summer a plan showing the system of water supply pipes, taken from the General plan of the Garden, was submitted to the Chief Engineer of the Department of Public Works, with a request that permission be granted to place a connection with the 36-inch water main, running through the grounds, at a point in front of the site of the Museum Building, and on September 14, 1897, the plan was approved by him without modification, and the following permit received:

The bearer has permission to place a six-inch connection on the 36-inch main in Bronx Park, east of Bedford Park Station, Harlem Railroad, without shutting off the main.

GEO. H. BIRDSALL,
Chief Engineer.

At a meeting of the Committee on Plans, held November 4, 1897, the Secretary was directed to address the following letter to the Commissioners of Public Parks:

I am instructed by the Committee on Plans of the Board of Managers of the New York Botanical Garden to request your honorable Board to include in the estimates for appropriations for the Department of Parks for 1898, the sum of $20,000.00, for the laying of water pipes and sewer pipes in the grounds set apart and provided for the use of the New York Botanical Garden in Bronx Park.

The money provided by the Board of Estimate and Apportionment, under the act of incorporation, is applicable only to buildings.

The following answer was received, dated December 6, 1897:

At a meeting of the Board of Parks, held on the 8th ult., the Board of Estimate and Apportionment was requested to include in

the appropriation the sum of $20,000.00 to provide for sewer and water pipes in Bronx Park, as requested in your communication of the same date. Pursuant to such action, a request for the appropriation of the sum named was duly communicated to the Board of Estimate and Apportionment.

Respectfully, WILLIAM LEARY,
Secretary.

Being informed that $50,000.00 additional appropriation for the parks north of the Harlem had been made by the Board of Estimate and Apportionment, but that the item for water pipes and sewer pipes for the Botanical Garden had not been specified, your Committee requested the Board of Estimate and Apportionment to specify this item, in order that the money might be available when needed; but your Committee is informed that the Board decided that it did not have the power to do so.

At a meeting of the Committee on Plans, held November 4, 1897, the Secretary was instructed to transmit the following letter to the Commissioners of Public Parks:

I am instructed by the Committee on Plans of the Board of Managers, New York Botanical Garden, to request you to construct driveways and paths of the Garden north and east of the Southern Boulevard, in accordance with the general plan filed with your honorable Board on June 12th, 1897.

I am further instructed to say that in the opinion of the Committee it is most desirable that the driveways and paths in the vicinity of the site of the museum building should be promptly constructed.

The following letter, dated Nov. 17th, 1897, was received in reply:

At a meeting of the Board of Parks, held on the 15th inst., the matter of the request of your Board of Managers, as contained in your communication of the 15th inst., respecting the construction of driveways and paths in the Botanical Garden grounds north and east of the Southern Boulevard in Bronx Park, was considered and approved, the work to be done at such time as funds may become available for the purpose.

Respectfully, WILLIAM LEARY,
Secretary.

There being an unexpended balance to the credit of the Park Department from the funds for the improvement of parks, parkways and drives, application was made therefor by the Board of Parks, and notice thereof given to the Secretary of your Committee by the following letter dated December 15th, 1897.

At a meeting of the Board of Parks, held on the 13th inst., application was made to the Board of Estimate and Apportionment for an issue of bonds to the amount of $15,000, under the provisions of Chapter 194, Laws of 1896, "An Act providing for the Improvement of Parks, Parkways and Drives," for the purpose of constructing driveways and paths in the New York Botanical Garden grounds, north and east of the Southern Boulevard in Bronx Park.

Respectfully, WILLIAM LEARY,
Secretary.

On December 17th, the Secretary caused a map to be made, taken from the general plan, showing the proposed plaza, and driveway running east from Bedford Park Station, together with the estimates of the amount of material necessary for its construction, and these were transmitted to the Board of Estimate and Apportionment by the Secretary of the Park Department to illustrate the above application which was thereafter allowed, as stated in the following letter to the Chairman of your Committee, dated December 27th, 1897:

At a meeting of the Board of Estimate and Apportionment, held December 23d, 1897, a resolution authorizing the issue of $15,000, for expense of constructing paths and driveways in the Botanical Garden in Bronx Park was adopted.

Very respectfully, CHAS. V. ADEE,
Clerk.

Under authority from your Committee the Chairman and Secretary, on December 17, 1897, approved for the Committee a bill of R. W. Gibson, architect, for $8,675.47, being 2½% upon the amount of the contract awarded to the John H. Parker Company, $347,019, and transmitted it to the Board of Parks, by whom it was approved, as appears from the following letter to the Secretary, dated December 22, 1897:

At a meeting of the Board of Parks, held on the 20th inst., a bill of R. W. Gibson, Architect, amounting to $8,675.47 on account of services in connection with Botanical Garden buildings in Bronx Park, was approved, audited and ordered transmitted to the Finance Department for payment.

Respectfully, WILLIAM LEARY,
Secretary.

It may be of interest to remark that by § 613 of the Act of the Legislature of this State, establishing the Greater New York, which went into effect on the 1st of January, 1898, it is provided that,

"It shall be the duty of the Commissioner of Parks for the borough of the Bronx to maintain the New York Botanical Garden and the buildings appurtenant thereto, and such other institutions or buildings as may be established or erected in any park, square or public place in his jurisdiction by authority of the municipal assembly."

The same duty in the same language is imposed upon the Commissioner for the Boroughs of Manhattan and Richmond as respects the Museum of Natural History, the Metropolitan Museum of Art in Central Park and the Aquarium in Battery Place.

The same section of the Act further provides:

"It shall be the duty of the several commissioners to provide the necessary instruments, furniture and equipments for the several buildings and institutions within their respective jurisdictions, and, with the authority of the municipal assembly, to develop and improve the same, and to erect additional buildings; but the maintenance of all such buildings and institutions shall be subject to the provisions of the acts incorporating said institutions, or either of them, and the acts amendatory thereof, and to the powers of said corporations thereunder, and of the boards by such acts created or provided for; and shall also be subject to and in conformity with such contracts and agreements as have heretofore been made with such institutions respectively, and are in force and effect when this act takes effect, or as may be hereafter made by the authority of the municipal assembly, and no moneys shall be expended for such purposes unless an appropriation therefor has

been made by the board of estimate and apportionment and the municipal assembly. Out of the moneys annually appropriated for the maintenance of parks, each commissioner may apply such sum as shall be fixed by the board of estimate and apportionment for the keeping, preservation and exhibition of the collections placed or contained in buildings or institutions now situated or hereafter erected in the parks, squares or public places under the jurisdiction of such commissioner."

Section 625 of the same Act provides that,

The Commissioner for the Borough of The Bronx is authorized and directed to carry out the existing contract made between the former Department of Parks and the New York Botanical Garden, providing for the allotment for the use of said Garden of two hundred and fifty (250) acres of land or less in the northern part of Bronx Park, as shown upon Map numbered 568, signed by Messrs. Vaux & Parsons, and filed by the former Department of Parks.

In closing, your Committee are glad thus to report that after many delays the work of construction is at last begun. We do not foresee any grounds for further delays. The time for the completion of the Museum building is fixed by the contract at 350 days. The new Commissioner of Parks for the Borough of The Bronx has expressed great interest in our enterprise, and we are confident he will give all needful and proper support to its future development.

ADDISON BROWN,
Chairman.

NEW YORK, January, 10, 1898.

REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND ANNUAL MEMBERS.

(*Submitted and accepted January 10, 1898.*)

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen:

At the annual meeting of January 11, 1897, it was reported that the number of persons who had qualified as annual members was 443

The number who have since qualified is 114

557

The number of members deceased and resigned during the year is 13

The total annual membership to date being 544

Annual dues for 1897 have been collected from 524 members, aggregating $5,240.00, which has been transmitted to the Treasurer as received. The number of members in arrears for annual dues for 1897 is 20.

A complete list of annual members to date is herewith submitted.

JOHN INNES KANE,
Chairman.

LIST OF ANNUAL MEMBERS, JAN. 10, 1898.

Robert Abbe, M.D.,
Frank Abbott, M.D.,
A. G. Agnew,
John T. Agnew,
Wm. C. Alpers,
Bernard G. Amend,
G. Amsinck,
J. M. Andreini,
John D. Archbold,
Edmund S. F. Arnold, M.D.,
Reginald H. Arnold,
Frederic Baker,
Geo. V. N. Baldwin,
N. A. Baldwin,
Robert F. Ballantine,
Ewald Balthasar,
Amzi Lorenzo Barber,
E. W. Barnes,
John S. Barnes,
Chas. T. Barney,
John Hendley Barnhart,
William Barr,

Wm. R. Barr,
E. W. Bass,
Thos. H. Bauchle,
Chas. C. Beaman,
Gerard Beekman,
M. H. Beers,
Staats S. Bell,
August Belmont,
Geo. H. Bend,
James H. Benedict,
Mrs. Adolph Bernheimer,
Chas. L. Bernheimer,
Simon Bernheimer,
Simon E. Bernheimer,
Edward J. Berwind,
Henry Beste,
Samuel R. Betts,
Francesco Bianchi,
Eugene P. Bicknell,
L. Horatio Biglow,
Isaac Bijur,
Miss Elizabeth Billings,
Chas H. Bisssell,
Geo. Blagden,
Mrs. Birdseye Blakeman,
Louis H. Blakeman,
Mrs. S. A. Blatchford,
George Bliss,
Geo. T. Bliss,
Lyman G. Bloomingdale,
Frank S. Bond,
Hon. H. W. Bookstaver,
Geo. S. Bowdoin,
John M. Bowers,
Michael Brennan,
M. P. Breslin,
Marvin Briggs,
Chas. Astor Bristed,
Jno. I. D. Bristol,
W. F. Brittain,

Mrs. Harriet Lord Britton,
Frederic Bronson,
Mrs. Kate M. Brookfield,
John Crosby Brown,
Robert I. Brown,
H. B. Brundrett,
William Bryce, Jr.,
W. Buchanan,
Albert Buchman,
Wm. Allen Butler,
John Cabot, M.D.,
George Calder,
Emil Calman,
Henry L. Calman,
Henry L. Cammann,
James C. Carter,
Wm. J. Cassard,
John H. Caswell,
Frank R. Chambers,
Chester W. Chapin,
Geo. E. Chisolm,
Mrs. Wm. E. Chisolm,
Jared Chittenden,
W. F. Chrystie,
E. Dwight Church,
John K. Cilley,
John Claflin,
Wm. N. Clark,
C. C. Clarke,
Banyer Clarkson,
Frederick Clarkson,
Wm. J. Coates, M.D.,
Wm. F. Cochran,
Miss Mary T. Cockcroft,
C. A. Coffin,
Chas. H. Coffin,
E. W. Coggeshall,
Samuel M. Cohen,
N. A. Colburn,
Miss Ellen Collins,

Alexander T. Compton,
E. C. Converse,
Wm. L. Conyngham,
C. T. Cook,
Mrs. C. T. Cook,
Geo. Coppell,
C. H. Coster,
Chas. J. Coulter,
Allyn Cox,
Francis Crawford,
Robert L. Crawford,
John D. Crimmins,
Frederic Cromwell,
Edwin A. Cruikshank,
Chas. Curie,
Wm. Gilbert Davies,
Ira Davenport,
Richard Deeves,
Robert W. DeForest,
Miss Julia L. Delafield,
Maturin L. Delafield, Jr.,
Chas. de Rham,
Theo. L. de Vinne,
W. B. Dickerman,
Chas. D. Dickey,
Mrs. Hugh T. Dickey,
Geo. H. Diehl,
Chas. F. Dieterich,
Miss Mary A. Dill,
Mrs. Henry F. Dimock,
Morgan Dix,
Cleveland H. Dodge,
Miss Grace H. Dodge,
Mrs. Wm. E. Dodge,
Mrs. Wm. E. Dodge, Jr.,
C. W. Doherty,
L. F. Dommerich,
Mrs. Henry Dormitzer,
O. B. Douglas, M.D.,
John J. Drake,
Miss Katharine Du Bois,
Matthew B. Du Bois,
Wm. A. Du Bois,
John P. Duncan,
Edward K. Dunham,
George H. Dunham,
H. A. Du Pont,
Thomas Dwyer,
Dorman B. Eaton,
Newbold Edgar,
Jarvis B. Edson,
Mrs. Jonathan Edwards,
J. Pierrepont Edwards,
August Eimer,
David L. Einstein,
Mrs. Matilda A. Elder,
Geo. W. Ellis,
John W. Ellis,
Wm. W. Ellsworth,
John J. Emery,
Louis Ettlinger,
E. Eyre,
Thos. H. Faile,
Jas. G. Fargo,
Mrs. Louis Fitzgerald,
Wm. L. Flanagan,
Oliver S. Fleet,
Miss Helena Flint,
A. R. Flower,
J. D. Flower,
Col. De Lancey Floyd-Jones,
James B. Ford,
Edw. W. Foster,
Mrs. A. Frankfield,
Joel Francis Freeman,
Henry Gade,
Frank S. Gannon,
Joseph E. Gay,
S. J. Geoghegan,
John J. Gibbons,

V. P. Gibney,
R. W. Gibson,
Chas. J. Gillis,
Frederic N. Goddard,
W. N. Goddard,
Chas. H. Godfrey,
Edwin L. Godkin,
Ogden Goelet,
Frederic Goodridge,
Mrs. Frederic Goodridge,
Francis Goodwin,
James J. Goodwin,
Hon. Wm. R. Grace,
Malcolm Graham,
Henry Graves,
John Greenough,
Isaac J. Greenwood,
Rev. David H. Greer,
Chester Griswold,
J. B. M. Grosvenor,
W. C. Gulliver,
W. S. Gurnee,
W. S. Gurnee, Jr.,
J. and M. Haffen,
James D. Hague,
Byron D. Halsted,
Misa Laura P Halsted,
Chas. T. Harbeck,
J. Montgomery Hare,
Marcellus Hartley,
Louis Haupt, M.D.,
G. G. Haven,
R. Somers Hayes,
J. Waldemar Hayward,
Homer Heminway,
Chas. R. Henderson,
Jos. J. Henderson,
Edmund Hendricks,
Samuel Henshaw,
James K. Hill,
Geo. D. Hilyard,
Wm. K. Hinman,
John H. Hinton, M.D.,
Abbott Hodgman,
Very Rev. E. A. Hoffman,
E. B. Holden,
E. R. Holden,
Henry Holt,
Burrett W. Horton,
G. H. Houghton,
Lucius W. How, M.D.,
Alfred M. Hoyt,
Samuel N. Hoyt,
Gen. Thos. H. Hubbard,
John E. Hudson,
Frank Hustace,
William Hustace,
Clarence M. Hyde,
Henry Iden, Jr.,
John B. Ireland,
Mrs. Adrian Iselin,
Adrian Iselin, Jr.,
Theo. F. Jackson,
A. Jacobi,
Robert Jaffray,
A. C. James,
D. Willis James,
E. G. Janeway,
Samuel M. Jarvis,
O. G. Jennings,
Walter Jennings,
James R. Jesup,
Geo. Pryor Johnson,
Adrian H. Joline,
Mrs. John D. Jones,
Walter R. T. Jones,
S. Nicholson Kane,
Mrs. H. F. Kean,
Mrs. A. B. Kellogg,
Mrs. Chas. Kellogg,

Thos. H. Kelly,
Edward Kemp,
J. F. Kemp,
H. Van Rensselaer Kennedy,
Mrs. Catherine L. Kernochan,
Geo. A. Kessler,
Wm. Kevan,
E. L. Keyes,
Adolph L. King,
David H. King, Jr.,
Herman Knapp,
Henry C. F. Koch,
Chas. Kohlman,
Percival Kühne,
H. R. Kunhardt, Jr.,
W. B. Kunhardt,
Adolf Kuttroff,
Francis G. Landon,
Woodbury Langdon,
J. D. Lange,
Jesse Larrabee,
Mrs. Samuel Lawrence,
W. V. Lawrence,
J. D. Layng,
Emanuel Lehman,
Arthur L. Lesher,
Mrs. John V. B. Lewis,
Philip Lewisohn,
Wm. S. Livingston,
Wm. C. Lobenstine,
Walter S. Logan,
Mrs. Daniel D. Lord,
Franklin B. Lord,
R. P. Lounsbery,
August Lueder,
Wm. T. Lusk,
Walther Luttgen,
David Lydig,
Samuel H. Lyman,
James D. Lynch,

Mrs. Alida McAlan,
C. W. McAlpin,
Geo. L. McAlpin,
Thos. J. McBride,
J. Jennings McComb,
Mrs. W. H. McCord,
John A. McCreery, M.D.,
Thos. A. McIntyre,
D. E. MacKenzie,
Rev. Haslett McKim,
George William McLanahan,
Chas. A. Macy, Jr.,
Wm. H. Macy, Jr.,
Chas. Mallory,
Theophilus M. Marc,
Jacob Mark,
T. M. Markoe,
Chas. M. Marsh,
Louis Marshall,
Brander Matthews,
Robert Maxwell,
David Mayer,
Harry Mayer,
Mrs. Emma Mehler,
Payson Merrill,
Henry Metcalfe,
J. Meyer,
Thos. C. Meyer,
S. M. Milliken,
Roland G. Mitchell,
Peter Moller,
John Monks,
Alphonse Montant,
John G. Moore,
Wm. H. Helme Moore,
E. D. Morgan,
Geo. H. Morgan,
A. H. Morris,
A. Newbold Morris,
Henry Lewis Morris,

Geo. Austin Morrison,
Ed. M. Muller,
Jas. B. Murray,
Isaac Myer,
Nathl. Myers,
Miss Agnes C. Nathan,
Adam Neidlinger,
Wm. Nelson,
George G. Nevers,
Geo. L. Nichols,
A. Lanfear Norrie,
Gordon Norrie,
James A. O'Gorman,
E. E. Olcott,
Dwight H. Olmstead,
Robert Olyphant,
Adolphe Openhym,
Mrs. Wm. Openhym,
Lowell M. Palmer,
Cortlandt Parker,
Charles Parsons,
John E. Parsons,
J. M. Patterson,
Geo. Foster Peabody,
Alfred Pell,
Wm. Hall Penfold,
Samuel T. Peters,
Anton Pfund,
Fred. S. Pinkus,
Gilbert M. Plympton,
Henry W. Poor,
De Veaux Powel,
Joseph M. Pray,
J. Dyneley Prince,
Chas. Pryer,
James Tolman Pyle,
M. Taylor Pyne,
Percy R. Pyne,
Jas. H. Quintard,
Gustav Ramsperger,

Geo. Curtis Rand,
George R. Read,
Wm. A. Read,
Whitelaw Reid,
John B. Reynolds,
John Harsen Rhoades,
Charles Rice, Ph.D.,
Auguste Richard,
Sam'l Riker,
Wm. C. Rives,
S. H. Robbins,
Miss Mary M. Roberts,
Andrew J. Robinson,
Frederick Rode,
H. H. Rogers,
N. C. Rogers,
Theo. Rogers,
Daniel G. Rollins,
Clinton Roosevelt,
W. Emlen Roosevelt,
Elihu Root,
Lewis B. Root,
Jacob Rothschild,
Wm. Rothschild,
Jacob Ruppert,
Chas. Howland Russell,
Clarence Sackett,
Reginald H. Sayre,
Edward C. Schaefer,
Robt. W. Schedler,
Carl Schefer.
J. Egmont Schermerhorn,
Wm. Jay Schieffelin,
Miss Jane E. Schmelzel,
Paul G. Schoeder,
S. L. Schoonmaker,
Carl H. Schultz,
C. Schumacher,
H. C. Schwab,
Adolph Schwarzmann,

Mrs. Horace See,
Isaac N. Seligman,
T. G. Sellew,
F. Seringhaus,
Mrs. Angelica B. Shea,
W. H. Sheehy,
Edward M. Shepard,
G. K. Sheridan,
Gardiner Sherman,
G. O. Shields,
Robt. Simon,
Mrs. Annie Morrill Smith,
Chas. S. Smith,
Edward A. Smith,
James R. Smith,
Hans Sommerhoff,
Chas. Sooysmith,
A. W. Soper,
Samuel Spencer,
Paul N. Spofford,
J. R. Stanton,
James R. Steers,
Benjamin Stern,
Louis Stern,
Francis L. Stetson,
Lispenard Stewart,
Wm. R. Stewart,
Jos. Stickney,
Miss Clara F. Stillman,
James Stokes,
Mason A. Stone,
Sumner R. Stone,
George Storm,
Edward Sturges,
F. K. Sturgis,
Mrs. George Such,
John S. Sutphen,
Albert Tag,
Edward N. Tailer,
Tozo Takayanagi,
C. A. Tatum,
Miss Alexandrina Taylor,
Peter B. Taylor,
Stevenson Taylor,
Wm. E. Tefft,
H. L. Terrell,
Ernest Thalmann,
Robert M. Thompson,
Walter Thompson,
William Thorne,
E. Titus, Jr.,
William Toel,
Wm. Toothe,
Howard Townsend,
R. H. L. Townsend,
C. D. Tows,
J. Evarts Tracy,
Benj. I. N. Trask,
Miss Susan Travers,
Mrs. J. B. Trevor,
Alfred Tuckerman,
Paul Tuckerman,
Edward P. Tysen,
E. S. Ullmann,
Miss Anna Murray Vail,
Herbert Valentine,
Mrs. Lawson Valentine,
Chas. H. Van Brunt,
Geo. R. Van Dewater,
E. H. Van Ingen,
Alfred Van Santvoord,
Edgar B. Van Winkle,
Miss Elizabeth S. Van Winkle,
Geo. H. Vose,
John Wagner,
Hon. Salem H. Wales,
Henry F. Walker,
Antony Wallach,
Wm. I. Walter,
E. A. Walton,

Wm. T. Wardwell,
Allan C. Washington,
John I. Waterbury,
Miss Emily A. Watson,
H. Walter Webb,
S. D. Webb,
W. H. Webb,
Geo. P. Webster,
Mrs. John A. Weekes,
Camille Weidenfeld,
R. E. Westcott,
Jno. M. E. Wetmore, M.D.,
Geo. G. Wheelock, M.D.,
Wm. E. Wheelock, M.D.,
Horace White,
Stanford White,
J. Henry Whitehouse,
Wm. Wicke,
Edward A. Wickes,
C. G. Williams,
Washington Wilson,
John D. Wing,
Grenville L. Winthrop,
Robert Dudley Winthrop,
Mrs. Frank S. Witherbee,
Ernest G. W. Woerz,
Emil Wolff,
Mrs. Cynthia A. Wood,
John D. Wood,
John A. Woods,
F. F. Woodward,
R. S. Woodward,
W. H. Woolverton,
Miss Cornelia S. Wray,
Edw. L. Young,
Andrew C. Zabriskie,
O. F. Zollikoffer,

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF.

(*Submitted and accepted January 11, 1897.*)

To the Board of Managers of the New York Botanical Garden.

Gentlemen: I have the honor to submit herewith my report as Secretary for the year ending January 11, 1897, and as Director since my appointment to that office on July 1, 1896.

Preparation of Plans.

The development of the general plan of the grounds and of the plans for the buildings has been continuously prosecuted under the direction of the Committee on Plans appointed, with power, on June 18, 1895, and of its sub-committee, appointed December 6, 1895, assisted by a commission of experts, appointed by the Board of Managers on June 17, 1896, as well as by advice and suggestions given by a large number of other experts from time to time.

The Committee on Plans obtained preliminary designs for the main buildings by means of a competition in which nine sets of plans were submitted by architects for the Museum Building and four sets of plans for the greenhouses. On June 17, 1896, the Committee reported to the Board of Managers that they had selected the preliminary plans, submitted by Mr. R. W. Gibson, for the Museum Building, and the preliminary greenhouse plans, submitted by the Lord & Burnham Company, and these selections were ratified by the Board of Managers, subject to the approval of the Commissioners of Public Parks.

This action was duly transmitted to the Commissioners of Public Parks and the following letter was received in reply:

Dear Sir:

Your letter of June 18th, enclosing copy of resolutions passed by the Board of Managers of the New York Botanical Garden, was submitted to our Board to-day, and I am authorized to inform

you that the Board of Park Commissioners cannot approve of plans until they are submitted in a complete form, together with specifications.

We believe that Mr. R. W. Gibson is in every way qualified to do the work, and also that Messrs. Lord & Burnham are among the leading contractors in their line, and while we look favorably upon your selection, we cannot approve of their appointment nor of the plans, until the same are completed and the locations of the various buildings given.

Yours truly,

S. V. R. CRUGER,

President.

This letter was submitted to Mr. R. W. Gibson and to the Lord & Burnham Company, together with the action taken by the Board of Managers, and they were requested to complete the plans and specifications, as required by the Commissioners of Public Parks.

The plans and specifications, since prepared by Mr. Gibson, are submitted complete to the Board at this meeting; those prepared by the Lord & Burnham Company are also submitted very nearly in complete form, only a few days more of office work being required to perfect them.

The detailed study which has been needed to bring the plans to their present condition has required much time, but it is believed that the plans are now satisfactory in all respects, and that the buildings constructed from them will admirably serve the purposes for which they are designed.

The general plan of the grounds, showing the positions selected for all the principal departments of the Garden, the roads and paths, together with grade sheets, showing the system of drainage, water supply and sewerage, were finally prepared by the Commission of Experts appointed on June 17, 1896, in coöperation with the Committee on Plans; it was submitted to the Board of Managers with the approval of the Committee on Plans on November 30, 1896, and was unanimously adopted by the Board on December 12, subject to such changes as may hereafter be found necessary.

Planting.

Borders. The planting of a border along the New York and Harlem Railroad, from the Southern Boulevard to the northwest corner of the Garden, was begun in April, 1896, and continued in November; a primary screen of trees has thus been established along this whole line of about 3,000 feet, broken by the space planned for a plaza in front of the Bedford Park Station, and by the western end of the proposed lake site. A similar primary screen of trees has been planted along the northern border, from the New York and Harlem Railroad to the northeast corner of the Garden; and the eastern border has been partially planted from the northeast corner, south for about 500 feet. Thirty-six different species of trees have been used in this primary planting. The temporary nurseries supplied many of the trees, the remainder were purchased.

Nurseries. The temporary nursery, established east of the Bronx in the fall of 1895, has been trebled in size, and another one located east of it and near the eastern border of the Garden, at the site suggested for a permanent nursery by the Plans Commission, has also been planted. The area occupied by the two together is about one acre, and they now contain, together with the borders, considered as additional temporary nurseries, about 11,300 trees, shrubs and perennial herbs, representing about 725 species, the material having mainly been purchased, though considerable has been raised from seed, or collected, or given. A portion of the marsh land near the northwestern corner of the Garden has been devoted to a temporary bog nursery.

Seeds and roots of about twenty-five species of forest herbs and shrubs have been planted in the woods at several places.

A complete card catalogue of the species in the whole Garden tract, both wild and introduced, is being made.

Care of Plantations.

The western border and the temporary nursery have been kept free from weeds by repeated hoeing, and many of the

plants have been moved to new positions during the fall, to obtain the advantage of transplanting and to improve the appearance of the screen along the railway, where trees planted in the spring failed on account of the prolonged drought.

Grading.

Some preliminary grading was done in the spring in preparing the ground for the tree border along the New York and Harlem Railway.

In August grading operations were begun along the Southern Boulevard where the banks of this road and an area of about two acres just south of it presented a very bad appearance. These banks were left in a very rough state when the Boulevard was constructed, and the two acre tract alluded to was used as a borrow pit several years ago for the building of roads in the vicinity of the park, its natural surface being thus destroyed. The banks of the Boulevard were graded to a slope of two to one by plowing and hand labor, and 4,000 cubic yards of soil, mostly topsoil, were obtained from Mr. J. B. McDonald, contractor for the excavation of the Jerome Park Reservoir, under the agreement entered into between him and the Board of Managers, which permits him to operate a temporary line of railway across the northern part of the Garden. The soil thus obtained was spread over the denuded tract by him, and its rough edges were graded down. All that now remains to do to put this region in good order is to sow the restored two-acre tract with grass seed, to face the Boulevard banks with topsoil, reserved for that purpose, and to sow them as well; this work should be done as soon as spring opens. A small amount of earth from the grading of these banks was used to fill up seven unsightly and dangerous cellar excavations of houses previously standing on the grounds, near the line of the Southern Boulevard.

Drainage.

Awaiting the completion of the general plan no permanent drains have been built, but the natural water courses have been opened and kept free from obstruction.

Temporary Greenhouse.

At the request of the Director, the President of Columbia University has kindly consented to permit the use of the greenhouse at the new Columbia University site, 116th Street and Amsterdam Avenue, for preserving tender plants during the present winter. The plants which have been placed there number 148 specimens. All these have been presented, as will be seen from the record of gifts appended to this report. Seeds of a large number of others have been planted in this greenhouse and space has been provided by constructing some new shelving to plant many more; seeds are being continually received from various sources, and it will be possible to sow several hundred species in the late winter and early spring.

Care of the Grounds.

From time to time during the year, dead and unsightly trees and shrubs, and trees of inferior appearance which interfered with the good ones, have been taken down, and many others have been pruned of dead branches. The tract is so liberally provided with trees that this work will need to go on, to a greater or less extent, every year. Fallen branches have also been cleared away, and loose stones have been removed from much of the site.

The hay of the tract was cut in July and August by George Hudson, of Bronxdale, on shares, he taking one-half and stacking one-half on the grounds. The part stacked has since been sold for $191.82, and this sum deposited with the Treasurer.

Williamsbridge and Bronx Park Sewer.

The Commissioner of Street Improvements of the 23d and 24th wards asked permission from the Board of Managers, in the spring, to construct a sewer across the northern part of the Garden, from Newell Avenue to a point on the N. Y. and Harlem Railway opposite the Mosholu Parkway, together with a branch extending to the eastern boundary of the Garden, the object being to connect the unfinished sewer system

of Williamsbridge, which had no outlet, with the large sewer extending south from Bedford Park under Webster Avenue, and thus to improve the sanitary condition of Williamsbridge, and to afford a sewer connection to the region east of Bronx Park. The course for this sewer selected by the engineers of the Department of Street Improvements, in consultation with the Secretary of the Board of Managers, places the entire line under ground, with the exception of a small portion near the two ends of its extent through the Garden, at which points the low embankments necessitated by the grades will be covered by the grading operations required in the construction of the proposed system of permanent roads; there is also a low embankment left just west of where this sewer passes under the Bronx, but the adjoining land may here be readily graded so as to remove any unsightly feature.

The construction of this main sewer, now nearly completed, has rendered it practicable to plan the minor sewers of the Garden that serve the several buildings, so as to connect with it, spurs from the main sewer having been liberally provided, and their location established on our maps.

Temporary Railway for the Construction of the Jerome Park Reservoir.

Mr. John B. MacDonald, contractor with the city for the excavation and building of the new reservoir at Jerome Park, made application to the Board of Managers on January 13, 1896, for permission to construct a temporary railway across the Garden for the purpose of transporting the great amount of earth and rock from these excavations to points east of the Garden, the tracks of this railway to cross the site mainly on an elevated trestlework. His request was endorsed by the Aqueduct Commissioners and by other city officials. With much reluctance, and after a careful consideration of the location of the line of the railway by the Committee on Plans, seeking to so place it as to interfere least with plans for the development of the tract, an agreement was finally entered into by the Board of Managers granting him the desired permission.

The construction of the temporary railway was begun September 1, 1896, and is now so far completed that trains are running over it nearly to the eastern side of the Garden.

Annual Members and Fellows.

Upon the invitation of the Committee on Patrons, Fellows and Annual Members, 443 persons have qualified as Annual Members, under the conditions established by the Board of Managers on March 4th and May 5th, 1896, and four persons have qualified as Fellows.

Library.

The formation of a library has been begun by the receipt of numerous books and pamphlets, as recorded in the schedules appended to this report.

Museums and Herbarium.

The material accumulated during the year for the museums and herbarium is also tabulated in an appendix to this report. It has not been definitely divided into specimens for the museums and for the herbarium, from the fact that the material has mostly been stored, and until cases are ready for its reception, it is not possible to determine just what portions of it will be finally placed in the one and what in the other.

Lectures.

In coöperation with the American Museum of Natural History, two lectures were delivered in April, 1896, before appreciative audiences, in the large lecture hall of the Museum, as follows:

April 11th, "Natural Scenery and Landscape Gardening," by Professor L. H. Bailey, of Cornell University.

April 18th, "Illustrations of the Desert Flora of Southern California," by Frederick V. Coville, of the U. S. Department of Agriculture.

Bulletin.

The publication of a BULLETIN, authorized by the Board of Managers, was begun by the issuing of the first number, a pamphlet of 21 pages with an outline map of the site, to all

members of the corporation, annual members, and a selected list of the botanical, horticultural, and agricultural institutions, societies and journals. An edition of 2,000 was printed, and copies have been sent to all persons who have since qualified as annual members. The second number of the BULLETIN, a pamphlet of 85 pages, and containing a copy of the general plan of the Garden, bears date January 1, 1897, and is now being distributed.

Appendix 1.

ACCESSIONS OF MATERIAL.

1. *Library.*

	Complete Volumes.	Pamphlets or Parts.
Massachusets Horticultural Society,.....		2
Thomas Craig,.....	1	
American Museum of Natural History,.....		1
Ohio Agricultural Experiment Station,.....		4
Agricultural Experiment Station, Rhode Island College of Agriculture,.....		2
Professor L. M. Underwood, nearly complete collection of bulletins and reports of agricultural experiment stations, about.....	1	1,800
Miss Anna Murray Vail,.....	5	
U. S. Department of Agriculture, Division of Forestry,.....		1
U. S. Department of Agriculture, Division of Vegetable Pathology and Physiology,.....		3
U. S. Department of Agriculture, Division of Botany,.....		1
Professor H. H. Rusby,.....	4	74
Alabama Agricultural Experiment Station,.....		1
Virginia Agricultural Experiment Station,.....		2
N. Y. Agricultural Experiment Station,.....		4
Rochester Academy of Sciences,.....	2	1
Professor Thomas C. Porter,.....		1
Mr. William E. Dodge,.....	1	6
Natural History Society of Glasgow,.....		1
Samuel Henshaw,.....	2	

Metropolitan Museum of Art,.....	1	
Dr. T. F. Allen,.....		28
Director-in-Chief, ...	12	63
Books accompanying Ellis Mycological Collection,.....	22	2
	51	1,997

2. Herbarium and Museum.

Mycological Collection of J. B. Ellis (purchased), estimated at.....	70,000	specimens.
Residual herbarium of the late P. V. Le Roy (purchased), estimated at.....	15,000	"
Plants from Western Mexico, collected by F. H. Lamb (purchased),..	195	"
Plants from Arizona, collected by Professor J. W. Toumey (purchased), about.....	400	"
Plants from the Lower Orinoco River, collected by Professor H. H. Rusby (purchased)	478	"
Collection of Newfoundland and Labrador lichens, made by the Rev. A. C. Waghorne (purchased), ...	135	"
R. Friedlander & Sohn, two collections of cryptogamic plants (purchased), about.....	1,000	"
Collection of lichens, made by Mr. B. F. Fink, (purchased),.....	95	"
Plants collected by A. A. Tyler, to illustrate the local flora (purchased), about.....	1,650	"
Collection of lichens and algæ, made by Dr. A. Schneider, to illustrate the local flora (purchased), about.....	750	"
Herbarium of the late Harry Edwards, presented by Mrs. Esther Herrman, about.....	4,000	"
Herbarium presented by Miss Anna Murray Vail, about.....	3,000	"
Collection of Ferns and Fern Allies of Madeira, presented by Dr. Adelbert Fenyes, about	50	"
Professor George M. Beringer.....	5	"
Director-in-Chief, miscellaneous specimens, about	584	"

Plants to illustrate local flora, collected by Mr. Geo. V. Nash, Assistant, about.....	2,200	specimens.
Plants from Nebraska, collected by Rev. J. M. Bates,.....	13	"
John H. Lovell, Waldboro, Me.,.....	4	"
Professor Thos. C. Porter,.....	28	"
Professor S. M. Tracy, Mississippi Thorn Trees,	9	"
Eugene P. Bicknell, from the vicinity of New York City.....	10	"
A. Franchet, Jardin des Plantes, Paris,.....	2	"
Professor C. H. Peck, State Botanist of New York,.....	5	"
Dr. T. E. Wilcox, Arizona,.....	10	"
Professor L. H. Bailey, Cornell University,.....	4	"
Dr. H. H. Rusby, collection of fruits of New York plants, preserved in formalin,.....	25	"
Dr. H. H. Rusby, collection of fruits from Venezuela, ...	8	"
Dr. H. H. Rusby, collection of fruits from Mexico,.....	6	"
Royal Botanic Gardens, Kew, Tasmania Mosses,	22	"
Professor H. H. Rusby, miscellaneous museum material, ...	20	"
U. S. Department of Agriculture, Division of Agrostology, seeds of the Giant Cane,.....	6	"
Professor H. G. Jesup, New Hampshire spruces, ...	2	"
	99,716	"

3. *Nurseries and Borders.*

A. Shrubs and Trees

Purchased from various sources,.....	5,315	"
Raised from seed,.....	55	"
Presented by Professor L. H. Bailey, Soulard Crab Apple,.....	2	"
	5,372	"

B. Perennial Herbs		
Purchased from various sources,.....	1,968	specimens.
Presented by Samuel Henshaw,.....	50	"
Raised from seed, obtained from various sources, about.....	1,500	"
	8,890	"

4. *Temporary Greenhouse.*

Miss Louise Veltin, a large palm,.....	1	"
Mr. John H. Scriven, large tropical plants,.....	4	"
Miss F. E. Lyon, Serpent Cactus, ...	1	"
Mr. Wm. H. S. Wood, miscellaneous collection,	20	"
Mrs. W. M. Gawtry, Cacti and other succulents,	8	"
Mr. C. F. Very, bulbs of Grayson County Lily,..	6	"
Mrs. W. E. Dodge, Century Plants,.....	2	"
Mr. J. H. Hayward, collection of bulbs from Madiera,.....	25	"
Rev. L. H. Lighthipe, a large *Poinsettia*,.....	1	"
Mr. Samuel Henshaw, miscellaneous collection of plants and bulbs,.....	70	"
Mrs. Samuel R. Filley, Century Plant,.....	1	"
Dr. T. E. Wilcox, seedlings of *Agave Palmeri*	3	"
Mrs. N. L. Britton, Cacti from Mexico,.....	6	"
	148	"
Mrs. Geo. Such, collection of orchids and other tropical plants, reserved for the Garden in her greenhouse at South Amboy, N. J., about.....	400	"

Appendix 2.

EXPENDITURES UNDER APPROPRIATIONS MADE BY THE BOARD OF MANAGERS, FROM OCTOBER 9, 1895, TO JANUARY 11, 1897.

Appropriation for Topographical Survey and Map.

1895.		Cr.	
Oct. 9,.....			$2,000.00
1896.		Dr.	
Jan. 9,.....	Estate of A. H. Napier,.....	$1,500.00	
	Estate of A. H. Napier,..... ..	500.00	$2,000.00

APPOPRIATION FOR LABELS.

1895.	Cr.		
Oct. 9,			$ 500.00
	Dr.		
Expended,			$ 215.33
Transferred to appropriation for engineering, gardening and landscape architecture,		150.00	365.33
Balance,			$ 134.67

APPROPRIATION FOR ELECTROTYPE OF MAP AND PRINTING.

1895.	Cr.		
Oct. 19,			$ 20.00
	Dr.		
National Photo-engraving Co.,			15.80
Balance,			$ 4.20

APPROPRIATION FOR THE PURCHASE OF SEEDS.

1895.	Cr.	
Oct. 9,		$5.00
	Dr.	
Expended,		5.00

APPROPRIATION FOR THE TEMPORARY NURSERY.

1895.	Cr.	
Oct. 9,		$500.00
	Dr.	
Expended,		476.04
Balance,		$23.96

APPROPRIATION FOR SCIENTIFIC DIRECTORS.

1895.	Cr.		
Oct. 9,			$250.00
1896.	Dr.		
Feb. 20,	Secretary, clerical assistance,	$50.00	
Mar. 23,	S. Henshaw, removing trees,	125.00	
" 20,	Secretary, clerical assistance,	50.00	
Apr. 18,	Secretary, cleaning grounds,	25.00	$250.00

Appropriation for Committee on Annual Members.

1896. Cr.

Mar. 4, ...	$300.00
May 5,.....	100.00
	$400.00

Dr.

Expended for circulars and postage, ...	$390.30
Balance,.	$9.70

Appropriation for Plans of Museum Building.

1896. Cr.

Mar. 4,.....	$2,000.00

1896. Dr.

Aug. 4,.....	N. Le Brun & Sons, fee for submitting competitive plans for the Museum Building,.....	$400.00	
	Ernest Flagg, fee for submitting competitive plans for the Museum Building,.....	400.00	
	Clinton & Russell, fee for submitting competitive plans for the Museum Building, ...	400.00	
	W. A. Potter, fee for submitting competitive plans for the Musuem Building, ...	400.00	
Nov. 3, ...	Transferred to appropriation for engineering, gardening, and landscape architecture,.....	400.00	$2,000.00.

Appropriation for Bulletin, Vol. I., No. 1.

1896. Cr.

Mar. 4,.....	$100.00

Dr.

Expended, ...	76.75
Balance, ...	$ 23.25

APPROPRIATION FOR LECTURES.

1896.	Cr.	
Mar. 4,		$150.00
	Dr.	
	Expended,	102.00
	Balance,	$ 48.00

APPROPRIATION FOR SCREEN OF TREES ALONG RAILROAD.

1896.	Cr.	
Mar. 4,		$700.00
	Dr.	
	Expended,	700.00

APPROPRIATION FOR SCIENTIFIC DIRECTORS, ASSISTANT TO SECRETARY.

1896	Cr.	
May 5,		$675.00
	Dr.	
	Expended,	600.00
	Balance,	$75.00

APPROPRIATION FOR LABOR AND TEAMS.

1896.	Cr.	
May 5,		$675.00
	Dr.	
	Expended,	624.41
	Balance,	$50.59

APPROPRIATION FOR SCIENTIFIC DIRECTORS, FOR ENGINEERING, GARDENING AND LANDSCAPE ARCHITECTURE.

1896.	Cr.	
May 5		$500.00
Nov. 30,	Transferred from appropriation for plans of Museum Building,	400.00

	Transferred from appropriation for labels, ...	150.00	
	Appropriation increased by Scientific Directors from General Fund,	280.00	
1897.			
Jan...6,	Appropriation increased by Scientific Directors from appropriation for museum material.....	50.00	
	Appropriation increased by Scientific Directors from appropriation for purchase of Cuban collection,	70.00	$1,450.00

Dr.

Expended,.....	$1,431.40
Balance,.....	$18.60

APPROPRIATION FOR SCIENTIFIC DIRECTORS, FOR PRELIMINARY DRAINAGE AND GRADING.

1896. Cr.

May 5, ...	$1,000.00

Dr.

Expended,.....	994.66
Balance, ...	$5.34

APPROPRIATION FOR SCIENTIFIC DIRECTORS, GENERAL FUND.

1896. Cr.

May 5,.....	$2,150.00

1896. Dr.

June 9,	Appropriation for museum, ...		$1,000.00
	Contingent fund for Director, ...	250.00	
	For purchase of Cuban collection from L. H. Pammel, ...	70.00	
Oct. 8,	Appropriation for plants and planting,	500.00	
Nov. 30,	Added to Contingent Fund, ...	50.00	
	Added to appropriation for engineering, gardening and landscape architecture, ...	280.00	$2,150.00

APPROPRIATION BY SCIENTIFIC DIRECTORS, FROM GENERAL FUND, FOR MUSEUM MATERIAL.

1896.	Cr.	
June 9,		$1,000.00
	Dr.	
	Expended,	946.98
	Transferred to appropriation for engineering, gardening and landscape architecture,	50.00
	Balance,	$3.02

APPROPRIATION BY SCIENTIFIC DIRECTORS, FROM GENERAL FUND, FOR CONTINGENT FUND.

1896.	Cr.	
June 9,		$250.00
Nov. 30,	Appropriation from general fund,	50.00
		$300.00
	Dr.	
	Expended,	$284.77
	Balance,	$15.23

APPROPRIATION BY SCIENTIFIC DIRECTORS, FROM GENERAL FUND, FOR PURCHASE OF CUBAN COLLECTION, FROM L. H. PAMMEL.

1896.	Cr.	
June 9,		$70.00
	Dr.	
	Transferred to appropriation for engineering, gardening and landscape architecture,	70.00

APPROPRIATION BY SCIENTIFIC DIRECTORS, FROM GENERAL FUND, FOR PLANTS AND PLANTING.

1896.	Cr.	
Oct. 8,		$500.00
	Dr.	
	Expended,	496.35
	Balance,	$ 3.65

APPROPRIATION FOR THE PURCHASE OF THE HERBARIUM OF DR. H. E. HASSE.

1896.	Cr.	
Nov. 30,		$337.50
	Dr.	
	Expended,	337.50

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF.

(Submitted and accepted January 10, 1898.)

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen: I have the honor to submit herewith my report as Secretary and Director-in-Chief for the year ending January 10, 1898:

Planting.

Nurseries. The nurseries, located in the east side of the Garden grounds, have been carefully cultivated throughout the season, and have furnished several thousand plants for the Herbaceous Grounds and Borders. A range of cold frames was built along one edge of the eastern nursery early in April, and seeds of about 2,700 species of plants, received from the Royal Gardens at Kew, the Botanical Garden of Smith College, Northampton, Mass., and other sources, were sown in them and in the open nursery ground. A large proportion of these seeds germinated during the season, and those of the woody plants have been allowed to remain in the ground undisturbed, as many of them are expected to germinate next year. Young plants and seedlings of some 75 species of shrubs and trees, not heretofore contained in the nurseries, have been obtained by purchase, gift and collection.

In October and November the nursery material of shrubs

and trees, planted in the fall of 1895, was transplanted to the borders, some of them planted to remain there permanently, but most of them ultimately to go into place in the Fruticetum and Arboretum. It is designed to suitably label these in the spring, so that they may be conveniently studied by visitors. The ground thus relieved will be devoted to herbaceous plants during the next season.

Borders. The border plantations along the New York and Harlem Railroad and the eastern and northeastern sides of the grounds have been cultivated, kept free of weeds, and where trees and shrubs had failed they have been replaced. The plants made good growth during the season, and already screen the trains from the grounds along a considerable portion of the western border. The planting is so arranged, however, that, with suitable thinning, vistas into the grounds from the railway will be provided.

Herbaceous Grounds. The planting of the herbaceous grounds, in accordance with the plan adopted, was begun in April and continued throughout the season. The beds for the different families of plants were dug in such a way as to provide a place for each family, of which representative species had been secured, and only about enough ground to provide space for the species in hand was dug for each family. Some 1,500 species, the majority of them perennials, were collected in the tract during the year, and most of them flowered. They were provided with stake labels, giving the common name, botanical name, and native country, and were visited and studied by many people during the summer and autumn. The greensward around and between the beds was mowed with a one-horse mowing machine, provided with a heavy roller, at intervals of about ten days, and the inequalities of the surface have been leveled, and the rough places have been graded and sown. The drainage of the area has been brought under satisfactory control by lowering the outlet of the central stream at the southern end. The rough stone wall at the eastern side of the grounds, where it joins the forest reserve, has been broken up, the stones removed

and vistas opened into the forest. Additional shade for the western side of this tract has been provided by the planting of trees and shrubs, of species related to the herbaceous plants which, in the arrangement, are located along this side.

The card-catalogue of species begun last year has been posted up as material has been obtained, and a complete record thus established of the origin of every plant. This includes the native flowering plants and ferns of the tract. A list of 2,682 species and varieties, showing their approximate location, taken from this card-catalogue, is herewith presented.

Grading.

The grading of the banks of the Southern Boulevard and the denuded area between that road and the property of St. John's College, which was begun in August, 1896, and continued until December, was taken up again in the spring of 1897; 2,000 cubic yards of top soil were obtained from Mr. J. B. McDonald, under his agreement with the Board of Managers, spread over the graded area, and sown, with the result that by early summer no evidence of the former unsightly appearance of this region was noticeable.

In May work was begun in filling the bog places in the north meadows and the former reaches of the Bronx River, in carrying out the feature of the general plan to restrict the river to one channel. Dirt for filling was obtained from Mr. J. B. McDonald, under the agreement above alluded to, and dumped from his temporary trestle at points convenient for cartage. This work was continued at intervals until December, with the result that about one-quarter of the amount of dirt required for the filling has been moved into place.

All but two of the numerous cellar excavations which disfigured the tract have been filled and properly graded.

The work of filling the reaches of the Bronx in the north meadows may conveniently go on as opportunity offers. It will be convenient to continue it during the winter while the ground is frozen.

Temporary Greenhouse.

The greenhouse on the Columbia University grounds at 116th St. and Amsterdam Ave., the use of which was kindly granted by the President of the University last year, has been very useful, and between 600 and 700 species of plants are now deposited in it, obtained from various sources. It was found necessary to repair parts of the roof and walls of this structure, but the expense incident to these repairs has been more than justified by the results.

Willamsbridge and Bronx Park Sewer.

The Williamsbridge and Bronx Park sewer, the construction of which across the grounds was begun by the Commissioner of Street Improvements of the 23d and 24th wards in 1896, under permission from the Board of Managers, was completed early in the year.

Temporary Railway for the Construction of the Jerome Park Reservoir.

This railway, constructed by Mr. J. B. McDonald, contractor for the city, for the excavation and building of the new reservoir at Jerome Park, under permission from and agreement with the Board of Managers, has been operated by Mr. McDonald throughout the year. No accident has occurred, as the crossings have been carefully guarded.

Care of the Grounds.

In continuance of the work begun last year, a considerable number of dead and imperfect trees have been removed from time to time during the year, dead branches pruned from others, and fallen branches gathered up and destroyed. There are now very few trees of imperfect character in the grounds to the west of the Bronx River, except in the densely wooded forest reserve where nature has, for the most part, been allowed to take her own course.

The scattering of paper and other refuse by visitors, which was a source of considerable annoyance last year, has been greatly reduced by means of a number of sign-boards placed

at the entrances and elsewhere, and by personal request of our workmen, two of whom have been kept on guard on Sundays and holidays. Damage to the plants by the breaking of limbs and picking of flowers has been reduced to an insignificant amount. In this attempt to enforce neatness and order we have had the coöperation of the Park Police.

The hay of the tract was cut in July and August by Geo. Hudson, of Bronxdale, on shares, and our share of it stacked; part of it was burned, probably by an incendiary; the remainder has been sold for $60.00, and this amount deposited with the Treasurer.

Lectures.

In coöperation with the American Museum of Natural History, a lecture was delivered in the large lecture hall of that institution on the evening of January 21, 1897, by Professor Henry H. Rusby, of the New York College of Pharmacy, on: "A Study of the Economic Features of the Lower Orinoco Region."

Library.

As will be seen by the appendix to this report regarding accessions of material, and by reference to the document of last year, a considerable amount of library material has already been obtained. This has been acknowledged as far as practicable and has been boxed, awaiting opportunity for properly cataloguing and binding it. Most of it is deposited at the Lorillard Mansion at Bronx Park.

The material received in exchange for the BULLETIN can readily be very greatly increased by correspondence, and it would appear desirable that provision be made for a librarian, whose duty it shall be to properly correlate and arrange these books and pamphlets, and send acknowledgments for them. For the present year it is proposed to have this done under the appropriation for Special Assistance.

Museums and Herbarium.

The accumulation of museum and herbarium material has gone forward steadily during the year, and the accessions

are tabulated in the appendix to this report. Awaiting the construction of the museum building, the material has been stored as received, and is at present located:

1. In the Terminal Storage Warehouse, foot of West 28th Street.

2. In the old Columbia University Buildings, East 49th Street.

3. In the Lorillard Mansion at Bronx Park.

4. At the American Museum of Natural History.

5. At the College of Pharmacy on West 68th Street.

6. At the new Columbia University Buildings on Morningside Heights.

8,600 specimens have been mounted for the herbarium and temporarily arranged for reference. Exchanges for duplicate material have been arranged with a number of institutions.

Appendix I.

ACCESSIONS OF MATERIAL.

I. Library.

	Volumes.	Pamphlets and parts.
Purchased under the appropriation for Library,..	76	
Donated by		
Dr. John C. Miner,.....	1	
W. A. Bastedo, ...	1	
Miss Anna Murray Vail,.....	2	
Professor L. M. Underwood,.....	1	
By exchange with Mr. Arthur Hollick,.....	20	
Given by the Director-in-Chief,.....	7	105
Given by Mr. Samuel Henshaw, ...	2	682
By exchange for Bulletin with other institutions, a list of which is given below, ...		530
Total.	110	1,317

List of Exchanges.

Institutions.

New York State Museum of Natural History.
American Museum of Natural History.

Smithsonian Institute, Washington, D. C.
Director United States Geological Survey.
Kew Gardens, London, England.
Botanical Department, Jamaica, West Indies.
Jardin Botanique, Geneva, Switzerland.
Botanical Garden, Trinidad, West Indies.
Missouri Botanic Garden, St. Louis.
University Library, Upsala, Sweden.
Denison University, Granville, Ohio.
Konigl. Bot. Museum, Berlin, Germany.
Field Columbian Museum, Chicago, Ill.
Agricultural Experiment Station, Auburn, Ala.
" " " Tucson, Arizona.
" " " Berkeley, Cal.
" " " Fort Collins, Colo.
" " " New Haven, Ct.
" " " Storrs, Ct.
" " " Newark, Del.
" " " Lake City, Fla.
" " " Experiment, Ga.
" " " Moscow, Idaho.
" " " Urbana, Ills.
" " " Lafayette, Ind.
" " " Ames, Iowa.
" " " Manhattan, Kans.
" " " Lexington, Ky.
" " " New Orleans, La.
" " " Baton Rouge, La.
" " " Orono, Maine.
" " " College Park, Md.
" " " Amherst, Mass.
" " " Agricultural College, Mich.
" " " St. Anthony Park, Minn.
" " " Agricultural College, Miss.
" " " Columbia, Mo.
" " " Lincoln, Neb.
" " " Reno, Nev.
" " " Durham, N. H.
" " " New Brunswick, N. J.
" " " Mesilla Park, N. Mex.

Agricultural Experiment Station, Geneva, N. Y.
" " " Ithaca, N. Y.
" " " Raleigh, N. C.
" " " Fargo, N. Dak.
" " " Stillwater, Oklahoma.
" " " State College, Penn.
" " " Kingston, R. I.
" " " Clemson College, S. C.
" " " Brookings, S. Dak.
" " " Knoxville, Tenn.
" " " Logan, Utah.
" " " Burlington, Vt.
" " " Blacksburg, Va.
" " " Madison, Wis.
" " " Laramie, Wyoming.
Brooklyn Institute of Arts and Sciences.
Botanic Garden, Cincinnati, Ohio.
New York Public Library.
Smith College, Northampton, Mass.
University of Wisconsin, Madison.
Victoria Gardens, Bombay, India.
U. S. Department of Agriculture.
Royal Botanic Garden, Glasnevin, Dublin, Ireland.

Journals.

Botanical Gazette, University of Chicago.
The Microscope, Washington, D. C.
American Monthly Microscopical Journal, Washington, D. C.
Pharmaceutical Record, N. Y. City.
Meehan's Monthly, Philadelphia, Pa.
Revue Bryologique, Cahan, Athis, France.
Nuevo Notarisia, Jardin Botanique, Padua, Italy.
Notarisia, Venice, Italy.
Botaniska Notiser, Lund, Sweden.
Erythea, Berkeley, Cal.
American Gardening, N. Y. City.
American Journal of Pharmacy, Philadelphia, Penn.
The Plant World, Washington, D. C.
Journal of Pharmacology, N. Y. City.
Bulletin of Pharmacy, Detroit, Mich.

Societies.

California Academy of Sciences, San Francisco.
Connecticut Academy of Sciences, New Haven.
Davenport Academy of Sciences, Iowa.
Kansas Academy of Sciences, Topeka.
Appalachian Mountain Club, Boston, Mass.
Massachusetts Horticultural Society, Boston.
St. Louis Academy of Natural Sciences, Mo.
Elisha Mitchell Scientific Association, Chapel Hill, N. C.
Natural Science Association of Staten Island.
New York Microscopical Society, Flatbush.
Cincinnati Society of Natural History, Ohio.
Pennsylvania Forestry Association, Philadelphia.
Wisconsin Academy of Arts and Sciences, Madison.
Edinburgh Botanical Society, Scotland.
K. K. Zool. Bot. Gesellschaft, Vienna, Austria.
Societe Botanique, Luxumburg, Belgium.
Societe Botanique, Brussels, Belgium.
Sociedad Broteriana, Jardin Botanique, Coimbra, Portugal.
Sociedad Cientifica Argentina, Buenos Ayres, S. A.
Philadelphia Mycological Center, Penn.

2. Museums and Herbarium.

	Specimens.
Dr. H. H. Rusby, fruits from Mexico and Tropical America, preserved in formalin, purchased,.....	75
Dr. H. H. Rusby, miscellaneous museum material, donated, ...	10
S. B. Parish, collection from Southern California, purchased, ...	280
P. K. Taylor, photographs of Brazilian plants, purchased,..	45
A. W. Anthony, collection from Southern California, purchased, ...	100
Herbarium of Dr. H. E. Hasse of Los Angeles, Cal., purchased, ...	6,500
A. E. Ricksecker, collection from the Danish West Indies, purchased, ...	400
Dulau & Co., British Hieracia, purchased,.....	80
Thomas Howell, collection from Oregon and Washington, purchased, ...	50

C. F. Sonne, collection from California, purchased, ... 181
A. D. E. Elmer, collection from Washington, purchased,.. 190
B. F. Bush, collection from Missouri, purchased,..... 175
Robert Combs, Cuban collection, purchased,.. 695
P. A. Rydberg, Montana collection, purchased, ... 750
J. H. Wiggins, algæ from Long Island, purchased,..... 40
Thomas Howell, Alaska collection, purchased,..... 100
F. L. Harvey, Maine Myxomycetes, purchased,..... 100
W. M. Glatfelter, hybrid willows, purchased,..... 35
Aven Nelson, Wyoming collection, purchased,..... 175
H. E. Brown, California collection, purchased,..... 88
A. Hollick, fossil plants from New Jersey, purchased, ... 25
Edward Palmer, collection from Durango, Mexico, purchased, ... 750
Mrs. N. T. Higginson, lichen herbarium, purchased,..... 1,576
J. K. Small, collection from eastern Virginia and North Carolina, purchased,..... 242
C. F. Baker, Colorado collection, purchased, ... 530
A. W. Stanford, Japanese ferns, purchased,..... 100
L. W. Carter, South Dakota collection, purchased,..... 100
F. L. Lewton, plants from Florida, purchased,..... 146
A. A. Tayler, specimens to illustrate local flora, purchased, ... 640
A. A. Heller, New Mexico collection, purchased,..... 350
A. S. Hitchcock, Kansas collection, purchased,..... 1,000
Eugene Autran, Paraguay collection, purchased,..... 872
Boissier Herbarium, miscellaneous, by exchange,..... 300
Herbarium of Harvard University, J. A. Allen's Cascade Mt. collection, purchased, ... 118
Herbarium of Harvard University, miscellaneous, by exchange,..... 240
A. J. McClatchie, California plants, purchased,..... 100
T. H. Kearney, Jr., Tennessee collection, purchased, ... 330
P. A. Rydberg, collection made in Montana and the Yellowstone National Park through funds provided by Mr. W. E. Dodge, estimated, ... 15,000
Miscellaneous specimens collected by Director-in-Chief, 450
Miscellaneous specimens collected by George V. Nash, Assistant, ... 150
Newlin Williams, specimens from the White Mountains, donated, ... 25

rofessor Thos. C. Porter, duplicates of Hayden's Rocky Mountain collection, by exchange, ... 450
Professor Thos. C. Porter, miscellaneous specimens, by exchange, ... 20
W. N. Clute, miscellaneous specimens, donated,..... 100
E. P. Bicknell, miscellaneous specimens, donated,.... 50
J. M. Bates, Nebraska specimens, donated,..... 20
Professor L. H. Pammel, illustration of the flora of Iowa, by exchange, ... 200
Dr. R. E. Kunze, Arizona collection, donated, estimated, 350
Royal Botanic Garden, Berlin, specimens trom tropical America, by exchange, ... 384
U. S. Department of Agriculture, collection of Idaho plants made by Sandberg, McDougal and Heller, by exchange,..... 630
L. H. Lighthipe, Florida collection, donated, about 300
Professor L. R. Jones, specimens of Vermont spruces, donated, ... 10
Professor C. F. Wheeler, Michigan spruces, donated,..... 2
C. G. Lloyd, photographs of fungi, purchased, ... 15
Professor William Hallock, photographs of sassafras trees, donated, ... 2
F. H. Comstock, photograph of an American elm, donated, 1
Miss Anna M. Vail, photograph of Lyell's Larch, donated, 1

35,648

3. Plants for the Grounds and Greenhouses.

W. C. Blasdale, California seeds, purchased,...	51	species.
U. S. Department of Agriculture, 4 parcels of seeds from Italy, Russia and Japan, by exchange, about.....	800	"
Botanic Garden of Smith College, Northampton, Mass., by exchange,.....	300	"
Royal Botanic Garden, Kew, seeds by exchange,	2,230	"
Seeds collected by the staff.....	500	"
L. H. Lighthipe, seeds of Florida plants, purchased,.....	87	"
Aug. Hartmann, 82 species of perennials from Germany, purchased,.....	240	specimens.
Wm. H. Harrison & Co., shrubs and trees, purchased,.....	160	"

John K. Small, herbaceous plants from Virginia and North Carolina, purchased, ...	25	specimens.
Mrs. Geo. Such, specimens of orchids and other greenhouse plants, donated,.....	400	"
D. M. Andrews, Colorado Cacti, purchased.....	40	"
Thos. Meehan & Sons, shrubs and trees, purchased, about.....	500	"
Professor W. J. Beal, Agricultural College, Mich., herbaceous plants, by exchange....	150	"
D. M. Andrews, Colorado herbaceous plants, purchased,.....	75	"
Herbaceous plants collected by Geo. V. Nash, Assistant, about.....	500	"
J. H. Ten-Eyck Burr, ferns from central New York, donated,.....	15	"
F. S. Curtis, collection of Cacti and other plants for greenhouses, donated,.....	175	"
S. W Harriot, palms and other greenhouse plants, donated,.....	16	"
James Angus, box trees and herbaceous perennials, donated,.....	15	"
Mr. F. Roemer, Cacti and other greenhouse plants, donated,.....	10	"
Frank E. Fenno, *Euphorbia Nicæensis*, donated,.....	5	"
W. N. Clute, ferns from Binghamton, N. Y., donated, ...	5	"
E. P. Bicknell, herbaceous perennials, donated,	8	"
Miss C. G. Soule, ferns from Massachusetts, donated,.....	4	"
Miss Anna Murray Vail, ferns and hardy perennials, donated,.....	20	"
Professor L. M. Underwood, *Trilliums* from central New York, donated,.....	8	"
Dr. H. H. Rusby, hardy perennials, donated,...	15	"
Hardy perennials collected by the Director-in-Chief, ...	200	"
Plants raised from seed during the year, about...	7,000	"
	9,586	

Appendix 2.

SCHEDULE OF EXPENDITURES DURING 1897 UNDER APPROPRIATIONS MADE BY THE BOARD.

Salaries.

1897.	Cr.	
Jan. 11,		$8,150.00
	Dr.	
Expended,		7,866.50
	Balance,	$283.50

Allowance for Engineering.

1897.	Cr.	
Jan. 11,		$1,000.00
	Dr.	
Expended,		607.83
	Balance,	$392.17

Appropriation for Labor and Teams.

1897.	Cr.	
Jan. 11,		$2,500.00
	Dr.	
Expended,		2,329.89
	Balance,	$170.11

Appropriation for Drainage and Grading.

1897.	Cr.	
Jan. 11,		$2,500.00
	Dr.	
Expended,		1,658.47
	Balance,	$841.53

Appropriation for Purchase of Plants and operating Temporary Greenhouse.

1897.	Cr.	
Jan. 11,		$1,000.00
	Dr.	
Expended,		659.03
	Balance,	$340.97

APPROPRIATION FOR CIRCULARS TO ANNUAL MEMBERS.

1897.	Cr.	
Jan. 11,.....		$250.00
	Dr.	
Expended,.....		229.75
Balance,.....		$20.25

APPROPRIATION FOR BULLETIN.

1897.	Cr.	
Jan. 11,.....		$250.00
	Dr.	
Expended,.....		229.02
Balance,.....		$20.98

APPROPRIATION FOR SCIENTIFIC DIRECTORS, FOR MUSEUM AND HERBARIUM MATERIAL.

1897.	Cr.	
Jan. 11,.....		$1,200.00
	Dr.	
Expended,.....		1,194.08
Balance,.....		$5.92

APPROPRIATION FOR SCIENTIFIC DIRECTORS, FOR LECTURES.

1897.	Cr.	
Jan. 11,.....		$200.00
	Dr.	
Expended,.....		54.20
Balance,.....		$145.80

APPROPRIATION FOR SCIENTIFIC DIRECTORS, FOR LIBRARY.

1897.	Cr.	
Jan. 11,.....		$300.00
	Dr.	
Expended,.....		258.79
Balance,.....		$41.21

APPROPRIATION FOR SCIENTIFIC DIRECTORS, FOR CONTINGENT FUND.

1897.	Cr.	
Jan. 11,		$500.00
	Dr.	
	Expended,	483.44
	Balance,	$16.56

ACCOUNT OF EXPENSES OF P. A. RYDBERG'S TRIP TO MONTANA, JUNE–SEPT., 1897, PAID BY MR. W. E. DODGE.

	Cr.	
Received from Mr. Dodge,		$672.14
	Dr.	
	Expended,	672.14

Appendix 3.

LIST OF PLANTS IN THE GROUNDS OF THE NEW YORK BOTANICAL GARDEN AND IN THE TEMPORARY GREENHOUSE, 1897.

B. Borders.
G. Greenhouse.
BG. Bog Garden.
H. Herbaceous Grounds.
N. Nursery.
W. Wild.

Abutilon "Africain." G.
Abutilon pedunculare. G.
Abutilon sp. G.
Acacia Farnesiana. G.
Acaena myriophylla. H.
Acaena ovalifolia. H.
Acaena sarmentosa. H.
Acalypha Virginica. W.
Acanthopanax ricinifolia. N.
Acer campestre. B.
Acer laetum. N.
Acer Negundo. N. B.
Acer obtusum. N.
Acer Pennsylvanicum. N. B.
Acer platanoides. B. N.
Acer pseudoplatanus. N. B.
Acer rubrum. W. B.
Acer rufinerve. N.
Acer saccharinum. B. N.
Acer Saccharum. W.
Acer spicatum. N. B.
Acer Tataricum. N.
Acer trilobatum. N.
Achillaea Ageratum. H.
Achillaea ligustica. H.
Achillaea Millifolium. H. W.
Achillaea Millifolium rubra. H. N.
Achillaea ptarmica alba. H.
Achillaea "The Pearl." H. N.
Achillaea tomentosa. H.
Aconitum Fischeri. H. N.
Aconitum Lycoctonum. H.
Aconitum Napellus. H.
Acorus Calamus. BG. W. H.
Actaea rubra. H.
Actaea spicata. H.
Actinella acaulis. H.
Adiantum hastatum. G.
Adiantum pedatum. H.
Adiantum pubescens. G.
Adonis vernalis. H.
Adopogon Carolinianum. W.
Adopogon Virginicum. H.
AErides sp. G.
AEsculus flava. N.
AEsculus glabra. N. B.
AEsculus Lyoni. B.
AEsculus parviflora. N. B.
AEthionema coridifolia. H.
AEthionema saccatilla. H.
AEthionema saxatile. N.
Agastache anethiodora. H.
Agastache nepetoides. H.
Agave Americana. G.
Agave Americana variegata. G.
Agave maculata. G.
Agave rigida. G.
Agave sp. Mexico. G.
Agave sp. G.
Agave sp. G.
Ageratum conyzoides. H.
Agrimonia Brittoniana. H.
Agrimonia hirsuta. W.
Agrimonia mollis. W.
Agrimonia odorata. H.
Agrimonia parviflora. H.
Agropyron dasystachyum. H.
Agropyron glaucum. H.
Agropyron Japonicum. H.
Agropyron repens. W. H.
Agropyron tenerum. H.
Agropyron unilaterale. H.
Agropyron violaceum. H.
Agrostemma Githago. H.
Agrostis alba. W. H.
Agrostis alba stolonifera. H.
Agrostis alba sylvatica. H.
Agrostis alba vulgaris. W.
Agrostis intermedia. W.
Agrostis perennans. W.
Ailanthus glandulosa. W.
Ajuga Chamaepitys. H.
Ajuga reptans. H.
Ajuga reptans variegata. H.

Akebia quinata. N.
Alchemilla vulgaris. H.
Aletris farinosa. H.
Alisma Plantago-aquatica. W.
Allium angulosum. H.
Allium cernuum. H.
Allium Cydni. H.
Allium fistulosum. H.
Allium Moly. H.
Allium oleraceum. H.
Allium Schoenoprasum. H.
Allium senescens. H.
Allium subhirsutum. H.
Allium tricoccum. H.
Allium vineale. H.
Alnus glutinosa. B.
Alnus incana. N. B.
Alnus incana tomentosa. N.
Alnus Japonica. N.
Alnus Oregona. N.
Alnus rugosa. W.
Alnus sp. Japan. N.
Alnus sp. N.
Aloe fruticosa. G.
Aloe grandiflora. G.
Aloe mitriformis. G.
Aloe picta. G.
Aloe succotrina. G.
Aloe sp. Mexico. G.
Aloe sp. Texas. G.
Alsine graminea. W.
Alsine longifolia. W.
Alsine pubera. H.
Althaea cannabina. H.
Althaea ficifolia. H. N.
Althaea ficifolia rosea. H.
Althaea Heldreichii. H.
Althaea officinalis. H.
Althaea rosea. H.
Althaea sulphurea. H.
Alyssum argenteum. H.
Alyssum saxatile compactum. N.
Alyssum spinosum. H.
Amaranthus caudatus. H.
Amaranthus hypochondriacus. H.
Amaranthus retroflexus. H.
Amaranthus speciosus. H.
Amaryllis sp. Madeira. G.
Ambrosia artemisiaefolia. W.
Ambrosia trifida. W. H.
Amelanchier alnifolia. N.
Amelanchier Botryapium. N. B.
Amelanchier Canadensis. N. B.
Amelanchier rotundifolia. B. N.
Amethystea coerulea. N.
Amorpha canescens. B.
Amorpha fruticosa. B.
Amorpha microphylla. H.
Ampelopsis Veitchii. N.
Amsonia Amsonia. H.
Anagallis arvensis coerulea. H.
Anaphalis margaritacea. H.
Anchusa Italica. H.
Anchusa officinalis. H.
Anchusa sempervirens. H.
Andromeda Polifolia. B. G.
Andropogon scoparius. W.
Andropogon Virginicus. W.
Andryala ragusina. H.
Anemone angulosa. H.
Anemone alpina. H.
Anemone Canadensis. N.
Anemone elegans. N.
Anemone Japonica alba. N.
Anemone Japonica rosea. N.
Anemone Japonica var. N.
Anemone nemorosa. H.
Anemone Pennsylvanica. H.
Anemone quinquefolia. H. W.
Anemone ranunculoides. H.
Anemone sylvestris. H.
Anemone Virginica. W.
Anemone sp. N.
Anoda Wrightii. H.
Antennaria neglecta. H. W.
Antennaria plantaginifolia. W. H.
Anthemis arvensis. H.
Anthemis Cotula. H.
Anthemis montana. H.
Anthemis tinctoria. H.
Anthericum Liliago. H.
Anthericum variegatum. G.
Anthoxanthum odoratum. W. H.
Anthurium Sherzerianum. G.
Anthurium sp. G.
Anthurium sp. G.
Antirrhinum majus. H.
Antirrhinum Orontium. H.
Antirrhinum sicculum. H.
Antirrhinum Ponticum. H.
Anychia Canadensis. W.
Apios Apios. W.
Apium Petroselinum. H.
Apocynum cannabinum. W. H.
Aquilegia Canadensis. W. H.
Aquilegia chrysantha. N. H.
Aquilegia coerulea. H.
Aquilegia Olympica. H.

Aquilegia Sibirica. H.
Aquilegia Skinneri. H.
Aquilegia vulgaris. H.
Aquilegia vulgaris alba. H.
Aquilegia vulgaris grandiflora. H.
Arabis albida. H.
Arabis Allionii. H.
Arabis alpina. H.
Arabis Canadensis. W.
Arabis cebenensis. H.
Arabis hirsuta. H.
Arabis lyrata. H.
Aralia canescens. N.
Aralia hispida. H.
Aralia Japonica. N.
Aralia nudicaulis. W. H.
Aralia pentaphylla. N.
Aralia racemosa. W. H.
Aralia spinosa. B.
Aralia spinosa canescens. N.
Arctium majus Kotschyi. H.
Arctium minus. W. H.
Arctium nemorosum. H.
Areca lutescens. G.
Arenaria serpyllifolia. W. H.
Arisaema Dracontium. H.
Arisaema triphyllum. W. H.
Arisaema sp. H.
Aristida dichotoma. W.
Aristida purpurascens. H.
Aristolochia Clematitis. H.
Arnica montana. H.
Aronia arbutifolia. N. B.
Aronia nigra. N.
Artemisia annua. H.
Artemisia Ludoviciana. H.
Artemisia Pontica. H.
Artemisia serrata. H.
Artemisia Stelleriana. H.
Artemisia sp. H.
Arum maculatum. H.
Aruncus Aruncus. H.
Arundinaria tecta. H.
Arundinella anomala. H.
Asarum Canadense. H.
Asarum Europaeum. H.
Asarum reflexum. W. H.
Asclepias exaltata. W.
Asclepias incarnata. B. G.
Asclepias pulchra. W. H.
Asclepias quadrifolia. H.
Asclepias speciosa. H.
Asclepias Sullivantii. H.
Asclepias Syriaca. W.
Asclepias tuberosa. H.
Ascyrum hypericoides. H.
Asimina triloba. N. B.
Asparagus officinalis. W. H.
Asparagus tenuissimus. G.
Asperula azurea. N.
Asperula galioides. H.
Asperula odorata. H.
Asphodeline liburnica. H.
Asplenium Felix-foemina. W. H.
Asplenium montanum. H.
Asplenium platyneuron. H.
Asplenium thelypteroides. H.
Asplenium Trichomanes. H.
Aster Amellus. H.
Aster azureus. H.
Aster cordifolius. H.
Aster cordifolius polycephalus. W.
Aster Curtisii. H.
Aster decoris. H.
Aster divaricatus. W. H.
Aster Drummondii. H.
Aster dumosus. H.
Aster ericoides. W.
Aster flexilis. H.
Aster laevis. H.
Aster lateriflorus. W. H.
Aster Lowrieanus. W. H.
Aster macrophyllus. W. H.
Aster multiflorus. W. H.
Aster Novae-Angliae. W. H.
Aster Novi-Belgii. H.
Aster paniculatus. BG.
Aster polyphyllus. H.
Aster ptarmicoides. H. N.
Aster puniceus. W. H.
Aster puniceus lucidulus. H.
Aster Tradescanti. W. H.
Aster umbellatus. H.
Aster undulatus. W.
Aster vimineus. W.
Aster sp. H.
Astilbe biternata. H.
Astilbe Japonica. H. N.
Astragalus alpinus. H.
Astragalus Canadensis. H.
Astragalus Carolinianus. H.
Astragalus chlorostachys. H.
Astragalus Cooperi. H.
Astragalus Crotallaria. H.
Astragalus glycyphyllos. H.
Astragalus pentaglottis. H.
Atriplex hortensis. H.
Atriplex hortensis rubra. H.

Atriplex littoralis. H.
Atropa Belladonna. H.
Avena sativa. W.
Avena Smithii. H.
Avena sterilis. H.
Azalea arborescens. B.
Azalea lutea. B.
Azalea nudiflora. W. N.
Azalea viscosa. BG. B.
Azalea sp. N.
Baeria coronaria. H.
Baptisia australis. H.
Baptisia leucantha. H.
Baptisia tinctoria. H.
Barbarea Barbarea. W. H.
Barbarea praecox. W. H.
Barbarea stricta. W. H.
Begonia discolor. G.
Begonia glaucophylla scandens. G.
Begonia hydrochotylifolia. G.
Begonia "Louise Curtis." G.
Begonia manicata. G.
Begonia Rex. G.
Begonia Saundersii. G.
Begonia sp. G.
Begonia sp. G.
Benzoin Benzoin. W. N. B.
Berberis Canadensis. N. B.
Berberis purpurea. N.
Berberis Sieboldii. N. H.
Berberis Sieboldii var. N.
Berberis Thunbergii. N. B.
Berberis virescens. N.
Berberis vulgaris. B.
Berkheya purpurea. H.
Berteroa incana. H.
Beta vulgaris. H.
Betula alba. B.
Betula Japonica. N.
Betula Ermani. N.
Betula lenta. N. W.
Betula papyrifera. N. B.
Betula populifolia. W. B.
Betula pumila fastigiata. N.
Betula rubra. N. B.
Betula ulmifolia. N.
Betula sp. N.
Betula sp. N.
Bicuculla Cucullaria. W.
Bicuculla formosa. H.
Bicuculla spectabilis. H.
Bidens frondosa. W.
Bidens bipinnata. W.
Bidens connata. W.
Bidens helianthoides. W.
Biscutella didyma lyrata. H.
Biscutella didyma opula. H.
Biscutella erigerifolia. H.
Blechnum Spicant. H.
Blephilia ciliata. H.
Blephilia hirsuta. H.
Blitum capitatum. H.
Blitum virgatum. H.
Bocconia cordata. H.
Bocconia Japonica. H.
Boehmeria cylindrica. W.
Boltonia asteroides. H.
Boltonia latisquama. H. N.
Bouteloua curtipendula. H.
Bouteloua oligostachya. H.
Brassia Gireoudiana. G.
Brassia verrucosa grandiflora. G.
Brassica Cheiranthos. H.
Brassica erucastrum. N.
Brassica tenuifolia. H.
Brauneria purpurea. H.
Briza minor. H.
Brodiaea uniflora. H.
Bromus albidus. H.
Bromus breviaristatus. H.
Bromus brizaeformis. H.
Bromus erectus. H.
Bromus inermis. H.
Bromus madritensis. H.
Bromus mollis. H.
Bromus propendens. H.
Bromus racemosus. W.
Bromus sterilis. H.
Bromus tectorum. H.
Broussonetia Kaempferi. N.
Buddleia curvifolia. N.
Buddleia intermedia. N.
Buddleia Lindleyana. N.
Bulbilis dactyloides. H.
Bulbine annua. N.
Bunias orientalis. H.
Buphthalmum speciosum. H.
Bupleurum longifolium. H.
Bursa Bursa-pastoris. W. H.
Butneria fertilis. B.
Butneria florida. B.
Butneria occidentalis. N.
Cacalia atriplicifolia. H.
Cacalia suaveolens. H.
Cactus Bonplandii. G.
Cactus Bridgesii. G.
Cactus colubrinus. G.
Cactus colubrinus flavispinus. G.

Cactus gemmatus. G.
Cactus Missouriensis. H.
Cactus speciosus. H.
Cactus variabilis. G.
Cactus viviparus. H.
Cactus sp. G.
Cactus sp. G.
Calamagrostis Canadensis. W.
Calamintha Acinos. H.
Calamovilfa longifolia. H.
Calandrinia grandiflora. N.
Calandrinia longiscapa. H.
Calandrinia pilosiuscula. H.
Calanthe furcata. G.
Calceolaria verticillata. H.
Calendula arvensis. H.
Calendula officinalis. H.
Calendula suffruticosa. H.
Callicarpa Japonica. N. B.
Callicarpa purpurea. N.
Callirrhoë involucrata. N. H.
Caltha palustris. B. G.
Campanula alliariaefolia. H.
Campanula aparinoides. W.
Campanula calyanthema. H. N.
Campanula Carpatica. H.
Campanula persicifolia. H.
Campanula rapunculoides. H.
Campanula Trachelium. H.
Camptosorus rhizophyllus. H.
Cannabis sativa. H.
Capnoides crystallinum. N.
Capnoides curvisiliquum. N.
Capnoides sempervirens. W. H.
Caragana arborescens. N. B.
Carbenia benedicta. H.
Cardamine bulbosa. W. H.
Cardamine Graeca. H.
Cardamine Pennsylvanica. W.
Cardiospermum microcarpon. G.
Carduus arvensis. W. H.
Carduus crispus. H.
Carduus Diacantha. H.
Carduus horridus. H.
Carduus intermedius. H.
Carduus muticus. W.
Carduus serratulus. H.
Carduus spinosissimus. H.
Carduus Syriacus. H.
Carex arctica. H.
Carex Asa-Grayi. W. H.
Carex cephalophora. W.
Carex costellata. W.
Carex crinita. W.
Carex cristatella. W.
Carex digitalis. W.
Carex fusca. H.
Carex gracillima. W.
Carex grisea. W.
Carex hystricina. W.
Carex lanuginosa. W.
Carex laxiculmis. W.
Carex laxiflora. W.
Carex laxiflora blanda. W.
Carex laxiflora patulifolia. W.
Carex longirostris. H.
Carex lupulina. W.
Carex Muhlenbergii. W.
Carex pedicellata. W.
Carex pubescens. W.
Carex retrorsa. H.
Carex scoparia. W.
Carex siccata. H.
Carex sparganoides. W.
Carex squarrosa. W.
Carex stipata. W.
Carex stricta. W.
Carex tentaculata. W.
Carex triceps. W.
Carex trichocarpa. H.
Carex Tuckermani. H.
Carex varia. W.
Carex virescens. W.
Carex vulpinoidea. W. H.
Carex sp. H.
Carex sp. H.
Carex sp. H.
Carpinus Betulus. B.
Carpinus Caroliniana. W. N. B.
Carthamus brevicaulis. H.
Carthamus flavescens. H.
Carum Carui. H.
Caryopteris Mastacanthus. H. N.
Cassia Marylandica. N. H.
Cassia nictitans. W.
Cassia occidentalis. G.
Cassia tora. G.
Castalia odorata. W.
Castanea dentata. W.
Castanea Japonica. N. B.
Castanea vesca. N. B.
Catalpa Bungei. N.
Catalpa Catalpa. H. B.
Catalpa Kaempferi. B. H.
Catalpa speciosa. B. N.
Catananche coerulea. H.
Cattleya amethysta glossa. G.
Cattleya Bowringiana. G.

Cattleya bicolor. G.
Cattleya crispa. G.
Cattleya Gaskelliana. G.
Cattleya Harrisoniae violacea. G.
Cattleya intermedia. G.
Cattleya labiata Warnerii. G.
Cattleya Leopoldii. G.
Cattleya luteola. G.
Cattleya Percivaliana. G.
Cattleya Schofieldiana. G.
Cattleya speciosissima. G.
Cattleya velutina. G.
Caulophyllum thalictroides. H.
Caylusea Abyssinica. H.
Ceanothus Americana. W. N.
Cedrela Sinensis. N.
Celastrus paniculata. H.
Celastrus scandens. W.
Celsia Pontica. H.
Celtis occidentalis. W. N. B.
Cenchrus tribuloides. W.
Cenia turbinata. H.
Centaurea Algeriensis. H.
Centaurea atropurpurea. H.
Centaurea diluta. H.
Centaurea eriopteris. H.
Centuraea Jacea. H.
Centaurea macrocephala. H.
Centaurea maritima. H.
Centaurea melitensis. H.
Centaurea nigrescens. H.
Centaurea Salmantica. H.
Centaurea scabiosa. H.
Centranthus macrosiphon. H.
Centranthus ruber. H.
Cephalanthus occidentalis. W.
Cephalaria leucantha. H.
Cephalaria Tatarica. H.
Cephalaria Transylvanica. H.
Cercidophyllum Japonicum. N. B.
Cercis Canadensis. N. B.
Cercis Japonica. N. B.
Cereus caesius. G.
Cereus candicans. G.
Cereus colubrinus. G.
Cereus flagelliformis. G.
Cereus grandiflorus. G.
Cereus Hamiltoni. G.
Cereus Jamacaru. G.
Cereus Jamacaru x grandiflorus. G.
Cereus leptophus. G.
Cereus McDonaldii. G.
Cereus macrogonus. G.
Cereus Mayrandi. G.
Cereus nycticalus. G.
Cereus Olfersii. G.
Cereus Peruvianus. G.
Cereus repandus. G.
Cereus rostratus. G.
Cereus serpentinus. G.
Cereus splendens. G.
Cereus tortuosus. G.
Cereus viridiflorus. H.
Cereus sp. Mexico. G
Cereus sp. Mexico. G.
Cereus sp. Arizona. G.
Cereus sp. G.
Cereus sp. G.
Cereus sp. G.
Cereus sp. G.
Cereus sp. G.
Cereus sp. G.
Cereus sp. G.
Cereus (Snake Cactus). G.
Cereus sp. G.
Cereus sp. G.
Cereus sp. G.
Chaetochloa glauca. W.
Chaetochloa Italica. H.
Chaetochloa verticillata. H.
Chaetochloa viridis. W.
Chamaecyparis pisifera. N.
Chamaedaphne calyculata. BG.
Chamaerops excelsa. G.
Charieis heterophylla. H.
Cheiranthus Cheira. H.
Chelidonium majus. H.
Chelone glabra. H.
Chelone Lyoni. H.
Chenopodium album. H. W.
Chenopodium Atriplicis. H.
Chenopodium opulifolium. H.
Chenopodium polyspermum. H.
Chimaphila maculata. W.
Chionanthus Virginica. N. B.
Chrysanthemum Balsamita tanacetoides. H.
Chrysanthemum carinatum. H.
Chrysanthemum coronarium. H.
Chrysanthemum corymbosum. H.
Chrysanthemum lacustre. H.
Chrysanthemum Leucanthemum. H. W.
Chrysanthemum macrophyllum. H.
Chrysanthemum praealtum. H.
Chrysanthemum segetum. H.
Cichorium divaricatum. H.
Cichorium Intybus. W.

Cicer arietinum. H.
Cicuta maculata. H.
Cimicifuga racemosa. H.
Cinna arundinacea. W.
Circaea Lutetiana. H. W.
Citrus trifoliata. N.
Cladrastis Amurensis var. N.
Cladrastis lutea. N. B.
Clarkia elegans. H.
Claytonia Virginica. H.
Clematis Douglasii. H.
Clematis Fremonti. H.
Clematis integrifolia. H.
Clematis ovata. N. H.
Clematis paniculata. N.
Clematis recta. H.
Clematis stans. N. H.
Clematis Viorna. H.
Clematis Virginiana. W.
Cleome arborea. H.
Cleome candelabra. N.
Cleome integrifolia. H.
Clethra alnifolia. W. B.
Clethra canescens. N.
Coccoloba platyclada. G.
Cocos Weddelliana. G.
Coelogyne barbata. G.
Coelogyne corrugata. G.
Coelogyne cristata. G.
Coelogyne cristata citrina. G.
Coelogyne cristata major. G.
Coelogyne cristata maxima. G.
Coelogyne flaccida. G.
Coelogyne latifolia. G.
Coelogyne Massangeana. G.
Coelogyne tomentosa. G.
Coelogyne sp. G.
Coix Lachryma-Jobi. H.
Collinsia grandiflora. H.
Collinsonia Canadensis. H.
Collomia coccinea. H.
Collomia gilioides. H.
Collomia sp. H.
Colutea arborescens. H.
Comandra umbellata. W.
Comarum palustre. H.
Commelina coelestis. H.
Comptonia peregrina. W. N.
Conium maculatum. H.
Conringia orientalis. H.
Convolvulus Mauritanicus. G.
Convolvulus sepium. H.
Convolvulus tricolor. H.
Convolvulus undulatus. H.
Corallorhiza sp. H.
Corchorus Japonica. B.
Coreopsis auriculata. N.
Coreopsis delphinifolia. H.
Coreopsis Drummondii. N. H.
Coreopsis grandiflora. H.
Coreopsis lanceolata. H. N.
Coreopsis latifolia. H.
Coreopsis rosea. H.
Coreopsis tinctoria. H.
Coreopsis tinctoria marmorata. H.
Coreopsis tripteris. H.
Coriandrum sativum. H.
Coriaria Japonica. N.
Cornus alba. N.
Cornus alternifolia. W. N.
Cornus Amomum. W.
Cornus candidissima. N. W.
Cornus circinata. N.
Cornus florida. W.
Cornus Mas. N. B.
Cornus sanguinea. N.
Cornus sanguinea variegata. B.
Cornus stolonifera. N.
Cornus sp. N.
Coronilla Emerus. N.
Coronilla scorpioides. H.
Coronilla varia. H.
Corylopsis spicata. N.
Corylus Americana. W. N.
Corylus Avellana. N. B.
Corylus Pontica. N.
Corylus purpurea. B.
Cotinus cotinoides. B.
Cotinus Cotinus. N. B.
Cotoneaster acutiloba. N.
Cotoneaster obtusa. N.
Cotoneaster Simmondsii. N.
Cotoneaster Wheeleri. N.
Crambe Hispanica. H.
Crataegus chlorosarca. N.
Crataegus cordata. B. N.
Crataegus glandulosa. B.
Crataegus Oxyacantha. W.
Crataegus tomentosa. N.
Crepis Candollei. H.
Crepis rubra. H.
Crepis setosa. H.
Crinum sp. G.
Crotalaria sagittalis. W.
Crucianella AEgyptiaca. H.
Cryptomeria Japonica. N.
Cymbidium atropurpureum. G.
Cuscuta Gronovii. W.

Cycas revoluta. G.
Cyclanthera explodens. H.
Cycloloma platyphyllum. H.
Cymbidium atropurpureum. G.
Cymbidium eburneum. G.
Cymbidium Hookerianum. G.
Cymbidium pendulum. G.
Cynara Scolymus. H.
Cynoglossum furcatum. H.
Cynoglossum petiolatum. H.
Cynoglossum pictum. H.
Cynosurus cristatus. H.
Cynosurus echinatus. H.
Cyperus alternifolius. G.
Cyperus diandrus. W.
Cyperus strigosus. W.
Cypripedium acaule. H.
Cypripedium albanense. G.
Cypripedium Ashburtoniae. G.
Cypripedium barbatum. G.
Cypripedium barbatum biflorum. G.
Cypripedium Bonallii. G.
Cypripedium Calceolus. H.
Cypripedium callosum. G.
Cypripedium caudatum. G.
Cypripedium concolor Reginaei. G.
Cypripedium Crossianum. G.
Cypripedium Dayanum. G.
Cypripedium Dominianum. G.
Cypripedium grande atratum. G.
Cypripedium Harrisianum. G.
Cypripedium Haynaldianum. G.
Cypripedium hirsutissimum. G.
Cypripedium insigne. G.
Cypripedium insigne albomarginatum. G.
Cypripedium Io. G.
Cypripedium Leeanum. G.
Cypripedium longifolium. G.
Cypripedium Lowei. G.
Cypripedium Manlei. G.
Cypripedium Niobe. G.
Cypripedium nitens. G.
Cypripedium niveum. G.
Cypripedium Roebelenii. G.
Cypripedium Schlimi albiflorum. G.
Cypripedium Sedeni. G.
Cypripedium Sedeni candidulum. G.
Cypripedium selligerum. G.
Cypripedium Spicerianum. G.
Cypripedium Stonei. G.
Cypripedium venustum. G.
Cypripedium sp. G.
Cytisus Laburnum. B.
Dactylis glomerata. W. H.
Danthonia compressa. W.
Danthonia spicata. W. H.
Daphne Mezereum. N.
Dasystoma flava. H.
Datura gigantea. H.
Datura inermis. H.
Datura Stramonium. H.
Datura Tatula. H.
Daucus Carota. W.
Delphinium dictyocarpum. H.
Delphinium elatum. H.
Delphinium formosum. H.
Delphinium Maackianum. H.
Delphinium scopulorum. H.
Delphinium Sinense. H.
Delphinium Staphis agria. H.
Delphinium tricorne. N.
Dendrobium aggregatum. G.
Dendrobium Ainsworthii. G.
Dendrobium Brymerianum. G.
Dendrobium capillipes. G.
Dendrobium Dayanum. G.
Dendrobium Dearei.? G.
Dendrobium glumaceum. G.
Dendrobium filiforme. G.
Dendrobium haemoglossum. G.
Dendrobium heterocarpum. G.
Dendrobium Japonicum. G.
Dendrobium Jenkinsii. G.
Dendrobium Kingianum. G.
Dendrobium Leechianum. G.
Dendrobium Lindleyanum. G.
Dendrobium Lowii. G.
Dendrobium macrophyllum giganteum. G.
Dendrobium moniliforme. G.
Dendrobium nobile. G.
Dendrobium Parishii. G.
Dendrobium primulinum. G.
Dendrobium pulchellum. G.
Dendrobium suavissimum. G.
Dendrobium tortile roseum. G.
Dendrobium Veitchianum. G.
Dendrobium Wardianum. G.
Dendrobium sp. G.
Dentaria diphylla. BG.
Dentaria laciniata. W. H.
Dentaria maxima. H.
Deringa Canadensis. W. H.
Deschampsia caespitosa. H.
Desmanthus virgatus. H.
Deutzia crenata. B.
Deutzia Fortunei. B.

Deutzia gracilis. N.
Deutzia gracilis (dwarf white). B.
Deutzia parviflora. N.
Deutzia scabra. B.
Deutzia Sieboldiana. N.
Dianthus atrorubens. H.
Dianthus barbatus. H.
Dianthus barbatus nigricans. H.
Dianthus capitatus. H.
Dianthus Chinensis. H. N.
Dianthus ciliatus. H.
Dianthus cruentus. H.
Dianthus cyclops. H.
Dianthus deltoides. H.
Dianthus fragrans. N. H.
Dianthus giganteus. H.
Dianthus "Her Majesty." H.
Dianthus latifolius. H.
Dianthus Mussini. H.
Dianthus plumarius. H. N.
Dianthus plumarius albus. H.
Dianthus plumarius annulatus. H.
Dianthus spectabilis. N.
Dianthus tener. H.
Dicksonia Barometz. G.
Dicksonia punctilobula. W.
Dictamnus Fraxinella. H.
Diervilla Diervilla. B.
Diervilla sessilifolia. B.
Digitalis gloxinioides. H.
Digitalis lanata. H.
Digitalis lutea. H.
Digitalis media. H.
Digitalis purpurea. H.
Dimorphanthes Manshuricus. N.
Dimorphotheca annua. H.
Dimorphotheca hybrida. H.
Dimorphotheca pluvialis. H.
Diospyros Virginiana. N.
Diplotaxis siifolia. H.
Diplotaxis tenuifolia. H.
Dipsacus fullonum. H.
Dipsacus laciniatus. H.
Dipsacus sylvestris. H.
Dirca palustris. B. N.
Dodecatheon Hendersoni. H.
Dodecatheon Meadia. H.
Dodecatheon Meadia var. H.
Dolichos sesquipedalis. H.
Dorycnium herbaceum. H.
Draba arabiscens. H.
Draba incana. H.
Draba pumila. H.
Draba verna. H. W.
Dracaena Lindeni. G.
Dracocephalum Austriacum. H.
Dracocephalum Moldavica. H.
Dryopteris acrostichoides. W.
Dryopteris aculeata. H.
Dryopteris Braunii. Planted.
Dryopteris Filix-mas. H.
Dryopteris Goldieana. H. N.
Dryopteris marginalis. W.
Dryopteris Noveboracensis. H. W.
Dryopteris spinulosa. H.
Eatonia nitida. W.
Eatonia Pennsylvanica. W.
Echeveria Californica. G.
Echinocactus alcicornis. G.
Echinocactus Berlandieri. G.
Echinocactus brevihamatus. G.
Echinocactus caespitosus. G.
Echinocactus capricornus. G.
Echinocactus gonacanthus. G.
Echinocactus Grusoni. G.
Echinocactus LeContei. G.
Echinocactus longchanin. G.
Echinocactus maritimus. G.
Echinocactus multicostatus. G.
Echinocactus ornatus Mirobelli. G.
Echinocactus pectinatus. G.
Echinocactus pilosus. G.
Echinocactus Roemeri. G.
Echinocactus Simpsoni. H.
Echinocactus Texensis. G.
Echinocactus viridescens. G.
Echinocactus sp. Texas. G.
Echinocactus sp. Texas. G.
Echinocactus sp. G.
Echinocactus sp. G.
Echinocactus sp. G.
Echinops Banaticus. H.
Echinops globifer. H.
Echinops sphaerocephalus. H.
Echinopsis multiplex. G.
Echinopsis Zuccarinianum. G.
Echium plantagineum. H.
Echium violaceum grandiflorum. H.
Echium vulgare. H.
Eclipta alba. N.
Eleagnus hortensis. N.
Eleagnus parvifolia. B.
Eleagnus umbellata. N. B.
Eleagnus umbellata var. N.
Eleocharis tenuis. W. H.
Eleusine coracana. H.
Eleusine stricta. H.
Elymus Americanus. H.

Elymus arenarius. H.
Elymus Canadensis. H. W.
Elymus Europaeus. H.
Elymus glaucus. H. N.
Elymus Virginicus. H.
Encelia subaristata. H.
Epidendron bicornutum. G.
Epidendron nemorale majus. G.
Epidendron sp. G.
Epigaea repens. W.
Epilobium trigonum. H.
Epipactis latifolia. H.
Epipactis palustris. H.
Epipactis rubiginosa. H.
Epiphegus Virginiana. W.
Epiphyllum violaceum. G.
Epiphyllum sp. G.
Epiphyllum sp. G.
Epiphyllum sp. G.
Equisetum arvense. W.
Equisetum fluviatile. W.
Equisetum hyemale. W.
Equisetum sylvaticum. H.
Eragrostis capillaris. W.
Eragrostis pectinacea. W.
Eragrostis Purshii. W. H.
Eragrostis reptans. W.
Erechthites hieracifolia. W.
Erianthus contortus. H.
Erigeron annuus. H. W.
Erigeron Canadensis. W. H.
Erigeron Philadelphicus. H.
Erigeron pulchellus. W. H.
Erigeron ramosus. W. H.
Erinus alpinus. H.
Eriogonum Alleni. H. N.
Eriogonum unbellatum. H.
Erodium gruinum. H.
Erodium malachoides. H.
Eryngium aquaticum. H.
Eryngium campestre. H.
Eryngium planum. H.
Eryngium rupestre. H.
Erysimum Doryanum. H.
Erysimum hieracifolium. H.
Erysimum Perofskianum. H.
Erythrina crista-galli. G.
Erythronium Americanum. W. H.
Eschscholtzia Californica alba. H.
Eucharidia minima. H.
Eucharis Amazonica. G.
Eugenia sp. G.
Euonymus alatus. N.
Euonymus Americanus. N. W.
Euonymus atropurpureus. N. B.
Euonymus Europaeus. N. B.
Euonymus radicans. N.
Eupatorium ageratoides. N. W. H.
Eupatorium capillifolium. G.
Eupatorium maculatum. W. H.
Eupatorium perfoliatum. W.
Eupatorium purpureum. W.
Eupatorium sp. Florida. G.
Euphorbia candelabra. G.
Euphorbia cirrhiformis. G.
Euphorbia coerulescens. G.
Euphorbia commutata. H.
Euphorbia coralloides. H.
Euphorbia corollata. N. H.
Euphorbia Cyparissias. H.
Euphorbia dendroides. H.
Euphorbia dentata. H.
Euphorbia Esula. H.
Euphorbia exigua. H.
Euphorbia flavicoma. H.
Euphorbia grandicornis. G.
Euphorbia grandidens. G.
Euphorbia grandidens picta. G.
Euphorbia Granti. G.
Euphorbia havenensis. G.
Euphorbia helioscopia. H.
Euphorbia hermantiana. G.
Euphorbia heterophylla. H.
Euphorbia hierosolymitana. H.
Euphorbia lactea. G.
Euphorbia maculata. W.
Euphorbia medicaginus. N.
Euphorbia Myrsinites. H.
Euphorbia nerifolia. G.
Euphorbia Nicaeensis. H.
Euphorbia nutans. W.
Euphorbia Peplus. H.
Euphorbia polygona. G.
Euphorbia serpentina. G.
Euphorbia splendens. G.
Euphorbia stricta. H.
Euphorbia Williamsi. G.
Euphorbia sp. G.
Euthamia graminifolia. W. H.
Euthamia leptocephala. H.
Exochorda grandiflora. N. B.
Fagopyrum Fagopyrum. H.
Fagus Americana. W. N.
Fagus sylvatica. N. B.
Falcata comosa. W. H.
Fedia cornucopiae. H.
Ferula nodiflora. H.
Festuca bromoides. H.

Festuca capillata. H.
Festuca duriuscula. H.
Festuca duriuscula crassifolia. H.
Festuca elatior. H. W.
Festuca Myuros. H.
Festuca octoflora. W.
Festuca ovina duriuscula trachyphylla. H.
Festuca ovina sulcata. H.
Festuca Shortii. H.
Festuca sp. H.
Ficaria Ficaria. H.
Ficus elastica. G.
Ficus repens. G.
Filifera Washingtoniana. G.
Foeniculum Foeniculum. H.
Foeniculum piperitum. H.
Forsythia Fortuni. B.
Forsythia intermedia. B.
Forsythia suspensa. N. B.
Forsythia viridissima. N. B.
Fourcroya variegata. G.
Fragaria Virginiana. H. W.
Fraxinus Americana. N. B. W.
Fraxinus Bungeana. N.
Fraxinus excelsior. H. B. N.
Fraxinus lutea. N.
Fraxinus Mandshurica. N.
Fraxinus Oregona. N.
Fraxinus Ornus. H. B. N.
Fraxinus Pennsylvanica. W. B. N.
Fraxinus platycarpa. N.
Fraxinus quadrangulata. B. N.
Fraxinus viridis. N.
Froelichia Floridana. N.
Fuchsia "Beauty's Bloom." G.
Fuchsia "Chas. Blanc." G.
Fuchsia "Dolly Varden." G.
Fuchsia "flacon de neige." G.
Fuchsia "inimitable." G.
Fuchsia "mammoth purple." G.
Fuchsia "Mrs. John Taylor." G.
Fuchsia "oriflamme." G.
Fuchsia "phenomenal." G.
Fuchsia speciosa. G.
Fuchsia "wave of life." G.
Fuchsia "white phenomenal." G.
Funkia albomarginata. H.
Funkia coerulea. H.
Funkia grandiflora. H.
Funkia magenta alba. N.
Funkia undulata variegata. N.
Gaillardia aristata. H.
Gaillardia aristata grandiflora. H.
Gaillardia grandiflora. N.
Gaillardia pulchella. H.
Galactia volubilis. G.
Galanthus nivea. H.
Galega officinalis. H.
Galinsoga brachystephana. H.
Galium Aparine. H.
Galium circaezans. H.
Galium Mollugo. N. H. W.
Galium recurvum. H.
Galium tenuissimum. H.
Galium tinctorium. H. W.
Galium trifidum. H.
Galium triflorum. W.
Galium verum. H.
Gasteria sp. G.
Gasteria sp. G.
Gaudinia fragilis. H.
Gaultheria procumbens. W.
Gaura angustifolia. G.
Gaura Lindheimeri. H.
Gaura parviflora. H.
Gelsemium sempervirens. G.
Gemmingia Chinensis. H.
Genista capitata. N.
Genista scoparia. N.
Genista tinctoria. H.
Gentiana acaulis. H.
Gentiana Andrewsii. H.
Gentiana Bigelovii. H.
Gentiana cruciata. H.
Gentiana Parryi. H.
Geranium maculatum. H.
Geranium Nepalense. H.
Geranium pratense album. H.
Geranium rivulare. H.
Geranium sanguineum. H. N.
Gerardia tenuifolia. W.
Geum Canadense. W. H.
Geum hispidum. H.
Geum rivale. BG.
Geum Roylei. H.
Geum strictum. H.
Geum triflorum. H.
Geum Virginianum. W.
Gilia achillaefolia. H.
Gilia bicolor. H.
Gilia capitata. H.
Gilia densiflora. H.
Gilia laciniata. H.
Gilia multicaulis. H.
Gilia squarrosa. H.
Gilia tricolor alba. H.
Gingko biloba. N.

Glaucium flavum. H.
Glechoma hederacea. W. H.
Gleditsia Sinensis. N.
Gleditsia triacanthos. B. W.
Glycine Soja. H.
Grindelia glutinosa. H.
Grindelia inuloides. H.
Guizotia Abyssinica. H.
Gymnocladus Canadensis. N. B.
Gypsophila elegans. N.
Gypsophila fastigiata. H.
Gypsophila paniculata. H.
Gyrostachys autumnalis. H.
Gyrostachys cernua. W.
Gyrostachys gracilis. W.
Habenaria bifolia. H.
Habenaria chlorantha. H.
Habenaria conopsea. H.
Habenaria odoratissima. H.
Habenaria pallens. H.
Habenaria rubra. H.
Hamamelis Virginiana. W. B.
Haworthia cymbiformis. G.
Hebenstretia tenuifolia. H.
Hebenstretia tenuifolia alba. H.
Hedeoma pulegioides. W.
Hedychium sp. G.
Hedypnois Persica. H.
Hedysarum coronarium. H.
Helenium autumnale. N.
Helenium quadridentatum. H.
Helenium tenuifolium. H.
Helianthemum Canadense. W.
Helianthus annuus. H.
Helianthus argophyllus. H.
Helianthus debilis. H. N.
Helianthus decapetalus. N. H.
Helianthus giganteus. W.
Helianthus laetiflorus. H.
Helianthus Maximiliani. H. N.
Helianthus mollis. N. H.
Helianthus multiflorus. N.
Helianthus multiflorus grandiflorus. N.
Helianthus occidentalis. H.
Helianthus orgyalis. H. N.
Helianthus rigidus. N.
Helianthus struruosus. W.
Helianthus rigidus semiplenus. H.
Helianthus tuberosus. N. H.
Helichrysum bracteatum. H.
Heliopsis laevis. H.
Heliopsis Pitcheriana. H.
Helleborus foetidus. H.
Helleborus niger. H.
Hemerocallis flava. H. N.
Hemerocallis fulva. H. N.
Hemerocallis Kwanso. H.
Hemerocallis Thunbergii. H.
Hepatica Hepatica. W.
Heracleum asperum. H.
Heracleum gummiferum. H.
Heracleum lanatum. H.
Herniaria hirsuta. H.
Hesperis matronalis. H.
Heterotheca subaxillaris. N.
Heuchera Americana. W. H.
Heuchera bracteata. H.
Heuchera pubescens. H.
Heuchera sanguinea. N.
Hibiscus aurantiacus. G.
Hibiscus chrysantha. G.
Hibiscus militaris. H.
Hibiscus Moscheutos. N. H.
Hibiscus Moscheutos albus. N.
Hibiscus Trionum. H.
Hibiscus violaceus. G.
Hibiscus sp. G.
Hibiscus sp. H. N.
Hicoria alba. W.
Hicoria laciniosa. N.
Hicoria minima. W.
Hicoria Pecan. N.
Hicoria ovata. W.
Hieracium amplexicaule. H.
Hieracium aurantiacum. H.
Hieracium Greenii. H. N.
Hieracium Gronovii. W.
Hieracium lactucaefolium. H.
Hieracium maculatum. H.
Hieracium pallidum. H.
Hieracium paniculatum. W.
Hieracium Pilosella. H.
Hieracium pratense. H.
Hieracium pulmonarioides. H.
Hieracium rupestre. H.
Hieracium scabrum. H.
Hieracium stoloniferum. H.
Hieracium venosum. H. W.
Hieracium vulgatum. H.
Hippocrepis multisiliquosa. H.
Holcus lanatus. H. W.
Homalocenchrus oryzoides. W.
Homalocenchrus Virginicus. W.
Houstonia coerulea. H.
Hovenia dulcis. N.
Hydrangea arborescens. B.
Hydrangea Otaksa. N.

Hydrangea paniculata. N. B.
Hydrangea radiata. N. B.
Hydrastis Canadensis. N. H.
Hydrocotyle Americana. W. H.
Hydrophyllum Canadense. H.
Hydrophyllum Virginicum. N.
Hypericum Ascyron. N. B.
Hypericum atomarium. H.
Hypericum calycinum. N.
Hypericum densiflorum. N.
Hypericum Drummondii. H. N.
Hypericum humifusum. H.
Hypericum Moserianum. H.
Hypericum mutilum. W.
Hypericum orientale decussatum. H.
Hypericum patulum. N.
Hypericum perforatum. H.
Hypericum procumbens. H.
Hypericum prolificum. B. N.
Hypoxis hirsuta. W. H.
Hyssopus officinalis. H.
Hyssopus officinalis aristatus. H.
Hystrix Hystrix. W.
Iberis amara. H.
Iberis amara spinalis. H.
Iberis corifolia. H.
Iberis Garrexiana. H.
Iberis Lagascana. H.
Iberis pectinata. H.
Iberis semperflorens. H.
Iberis Sibirica. H.
Iberis umbellata. H.
Ilex Sieboldi. N.
Impatiens Balsamina. H.
Impatiens biflora. W.
Impatiens scabrida. N.
Inula Helenium. H. N.
Inula salicina. H.
Ipomoea superba. H.
Iris Caroliniana. H.
Iris cristata. H.
Iris Germanica. H. N.
Iris Germanica odoratissima. N.
Iris hexagona. BG.
Iris Kaempferi. H. N.
Iris lacustris. H.
Iris laevigata. H.
Iris longipetala. N.
Iris macrosiphon. N.
Iris Missouriensis. H.
Iris Pseudacorus. BG.
Iris pumila. H.
Iris Sibirica. H.
Iris verna. H.
Iris versicolor. W. H.
Iris sp. H.
Isatis tinctoria. H.
Itea Virginica. N. B.
Iva xanthiifolia. H.
Jasione perennis. H.
Jeffersonia diphylla. H.
Juglans cinerea. N. B.
Juglans nigra. W. N. B.
Juglans regia. N. B.
Juglans Sieboldiana. N.
Juncoides campestre. W. H.
Juncus bufonius. W.
Juncus tenuis. W.
Juniperus Davurica. N.
Juniperus Suecica. N.
Juniperus Virginiana. W.
Jurinea alata. H.
Jussiaea Peruviana. G.
Jussiaea suffruticosa. H.
Justicia procumbens. H.
Kalmia angustifolia. N.
Kalmia glauca. N.
Kalmia latifolia. W.
Kentia Balmoriana. G.
Kleinia articulata. G.
Kleinia sp. G.
Kneiffia fruticosa. W. H.
Kneiffia fruticosa Pilosella. W.
Kneiffia pumila. W. H.
Koeleria cristata. H.
Koellia mutica. W.
Koellia Virginiana. H. N.
Koelreuteria paniculata. B.
Koniga maritima. H.
Kosteletzkya altheaefolia. G.
Kuhnistera candida. H.
Kuhnistera violacea. H.
Lacinaria cylindrica. H.
Lacinaria pycnostachya. H.
Lacinaria scariosa. H.
Lacinaria spicata. H.
Lactuca hirsuta. H.
Lactuca spicata. H.
Lactuca villosa. H.
Laelia anceps. G.
Laelia elegans. G.
Laelia Gouldiana. G.
Laelia grandis. G.
Laelia purpurata. G.
Lagerstroemia Indica. G.
Lagerstroemia rosea. G.
Larix laricina. W.
Latania Borbonica. G.

Lathyrus Aphaca. H.
Lathyrus Aphaca polyantha. H.
Lathyrus articulatus. H.
Lathyrus Cicera. H.
Lathyrus latifolius. H.
Lathyrus latifolius albus. H.
Lathyrus Ochrus. H.
Lathyrus ochroleucus. H.
Lathyrus palustris. W.
Lathyrus pannonicus Smithii. H.
Lathyrus sativus. H.
Lathyrus sylvestris. H.
Lathyrus tingitanus. H.
Lathyrus venosus. H.
Lavatera Thuringiaca. H.
Lavatera trimestris. H.
Lechea intermedia. W.
Lechea Leggettii. W. H.
Legouzia perfoliata. W.
Lemna minor. W.
Lens esculentum. H.
Leontodon autumnale. W.
Leontodon hastilis. H.
Leonurus Cardiaca. H. W.
Leonurus Sibiricus. H.
Leonurus Tataricus. H.
Lepidium graminifolium. H.
Lepidium incisum. H.
Lepidium Menziesii. H.
Lepidium Virginicum. W. H.
Leptandra Virginica. H.
Leptorchis liliifolia. H.
Leptosyne Douglasii. H.
Lespedeza bicolor. N. B.
Lespedeza capitata. H.
Lespedeza frutescens. W.
Lespedeza sp. H.
Lespedeza sp. H.
Leucothoë Catesbaei. N.
Leucothoë racemosa. B.
Leucothoë recurva. B.
Leucojum vernum. H.
Ligusticum ferulaceum. H.
Ligustrum buxifolium. N.
Ligustrum Ibota. N.
Ligustrum Japonicum. B. N.
Ligustrum Jaconicum.? N.
Ligustrum medium. N.
Ligustrum medium var. N.
Ligustrum ovalifolium. B.
Ligustrum vulgare. B.
Ligustrum sp. N.
Lilium Canadense. W. H.
Lilium superbum. W.
Limonium latifolium. H.
Limonium sinuatum. H.
Linaria anticaria. H.
Linaria bipartita. H.
Linaria Canadensis. W. H.
Linaria Chalepensis. H.
Linaria Dalmatica. H.
Linaria Linaria. W. H.
Linaria Maroccana. H.
Linaria minus. H.
Linaria multipunctata. H.
Linaria Peloponnesiaca. H.
Linaria Percyi. H.
Linaria purpurea. H.
Linaria reticulata. N.
Linaria saxatilis. H.
Linaria spartea. H.
Lindelofia spectabilis. H.
Linum angustifolium. H.
Linum grandiflorum coccineum. H.
Linum Lewisii. N.
Linum nervosum. H.
Linum perenne. H.
Linum usitatissimum. H.
Liquidambar Styraciflua. B. W.
Liriodendron Tulipifera. B. W.
Liriodendron Tulipifera fastigiata. N.
Liriodendron Tulipifera variegata. N.
Lithospermum officinale. H.
Lobelia cardinalis. H.
Lobelia Erinus. H.
Lobelia inflata. W.
Lobelia syphilitica. W.
Lobelia triquetra. H.
Lolium perenne. W.
Lonas inodora. H.
Lonicera Albertii. N.
Lonicera brachypoda. N.
Lonicera ciliata. N.
Lonicera flava. N.
Lonicera fragrantissima. N. B.
Lonicera Ledebourii. N.
Lonicera Morrowi. N.
Lonicera orientalis. B. N.
Lonicera Phylomelae. N. B.
Lonicera Ruprechtiana. N.
Lonicera Sibirica. N. B.
Lonicera Standishii. N. B.
Lonicera Tatarica. B.
Lonicera Xylosteum. N. B.
Lonicera sp. N.
Lotus ornithopodioides. H.

Lotus tenuis. H.
Lotus tetragonolobus. H.
Ludwigia alternifolia. H.
Lunaria annua. H.
Lunaria rediviva. H.
Lupinus affinis. H.
Lupinus angustifolius. H.
Lupinus arboreus. H.
Lupinus elegans. H.
Lupinus micranthus. H.
Lupinus mutabilis. H.
Lupinus perennis. H.
Lupinus pubescens. H.
Lupinus pulchellus. H.
Lycaste aromatica. G.
Lycaste Skinneri. G.
Lychnis Chalcedonica. H.
Lychnis Coeli-rosa. H.
Lychnis Coeli-rosa elegans. H.
Lychnis coronaria. H. N.
Lychnis Flos-cuculi. H.
Lycium Chinense. N.
Lycium sp. N.
Lycopus Europaeus. H.
Lycopus rubellus. H.
Lycopus sinuatus. H.
Lycopus Virginicus. W.
Lygeum Spartum. H.
Lysimachia Nummularia. W. H.
Lysimachia punctata. H.
Lysimachia quadrifolia. W. H.
Lysimachia terrestris. W. H.
Madia sativa. H.
Magnolia acuminata. N. B.
Magnolia Fraseri. N.
Magnolia macrophylla. H. B. N.
Magnolia tripetala. N. B. H.
Magnolia Virginiana. N.
Malope trifida. N.
Malus coronaria. B.
Malus Malus var. N.
Malus Soulardi. N.
Malva Alcea. N. H.
Malva crispa. H.
Malva moschata alba. H.
Malva oxyloba. H.
Malva parviflora. H.
Malva rotundifolia. W.
Malva sylvestris. H.
Malva verticillata. H.
Malvastrum limense. H.
Mamillaria applanata. G.
Mammillaria arietina. G.
Mammillaria cirrhifera longispina. G.
Mammillaria elegans. G.
Mammillaria minima. G.
Mammillaria nivea. G.
Mammillaria pusilla. G.
Mammillaria stella-aurata. G.
Mammillaria sp. G.
Mariana Mariana. H.
Maranta pumila. G.
Maranta sp. G.
Martynia fragrans. H.
Matricaria inodora discoidea. H.
Matthiola sinuata. H.
Medeola Virginiana. H.
Medicago lappacea denticulata. H.
Medicago lupulina. W. H.
Medicago Murex. H.
Medicago orbicularis. H.
Medicago sativa. H.
Megapterium Missouriense. H. N.
Meibomia Canadensis. N. W. H.
Meibomia Dillenii. W. H.
Meibomia Illinoensis. H.
Meibomia Japonica. N.
Meibomia nudiflora. W. H.
Meibomia paniculata. H. N. W.
Meibomia viridiflora. H.
Melampyrum lineare. W. H.
Melia Azederach. N.
Melilotus alba. W. H.
Melilotus Indica. H.
Melilotus officinalis. W. H.
Melissa officinalis. H.
Mentha aquatica. H.
Mentha Canadensis. H.
Mentha crispa. H.
Mentha gentilis. H.
Mentha piperita. H.
Mentha spicata. H.
Mercurialis annua. H.
Mercurialis perennis. H.
Mertensia Virginica. H.
Mesembryanthemum cordifolium. H.
Miltonia Clowesii. G.
Miltonia Moreliana. G.
Miltonia sp. G.
Mimulus alatus. H.
Mimulus ringens. W.
Mirabilis divaricata. H.
Mirabilis Jalapa. H.
Miscanthus Japonicus. H. N.
Miscanthus Japonicus gracillimus. H. N.
Miscanthus Japonicus zebrinus. H.N.
Mitchella repens. W. H.

Mohrodendron Carolinum. N.
Mohrodendron dipterum. N.
Mollugo verticillata. W.
Moluccella laevis. H.
Monarda clinopodioides. H.
Monarda didyma. H.
Monarda fistulosa. H.
Monolepis trifida. H.
Monotropa uniflora. W.
Morus alba. N.
Morus Japonica. N. B.
Morus rubra. W. N.
Morus Tatarica. N.
Muhlenbergia diffusa. W.
Muhlenbergia Mexicana. W.
Muhlenbergia sobolifera. W.
Muhlenbergia tenuiflora. H.
Musa Cavendishii. G.
Musa sapientum. G.
Myosotis collina. H.
Myosotis laxa. W.
Myosotis palustris semperflorens. H.
Myrica Caroliniana. W.
Myrica Gale. BG.
Nabalus ? trifoliolatus. W. H.
Nemesia floribunda. N.
Nemesia strumosa. N.
Nemesia versicolor. H.
Nepeta Cataria. W. H.
Nepeta nuda. H.
Nephrolepis exaltata. H.
Nicotiana alata. H.
Nicotiana Langsdorffi. N.
Nicotiana paniculata. N.
Nierembergia frutescens. H.
Nigella Damascena. H.
Nigella sativa. H.
Nolana paradoxa. H.
Nymphaea Kalmiana. W.
Nyssa sylvatica. W.
OEnanthe peucedanifolia. H.
OEnanthe pimpinelloides. H.
OEnanthe silaifolia australis. H.
OEnothera brachycarpa. H.
OEnothera caespitosa. H.
OEnothera densiflora. H.
OEnothera odorata. H.
OEnothera tenella. H.
Omphalodes linifolia. H.
Onagra biennis. W. H.
Onagra biennis grandiflora. H.
Oncidium Papilio. G.
Oncidium phymatochilum. G.
Oncidium splendidum. G.
Onobrychis sativa. H.
Onoclea sensibilis. W. H.
Ononis arvensis. H.
Ononis arvensis maritima. H.
Ononis spinosa alba. H.
Onopordon Acanthium. H.
Ophioglossum arenarium. H.
Ophrys apifera. H.
Ophrys arachnifera. H.
Ophrys aranifera. H.
Ophrys atropophora. H.
Ophrys Bertolonii. H.
Ophrys fusca. H.
Ophrys myodes. H.
Opulaster opulifolius. B.
Opuntia basilaris. G.
Opuntia brachyantha. G.
Opuntia Brasiliensis. G.
Opuntia crinifera. G.
Opuntia cylindrica. G.
Opuntia dulcis. G.
Opuntia Emoryi. G.
Opuntia Engelmanni. G.
Opuntia Engelmanni occidentalis. G.
Opuntia Ficus-Indica. G.
Opuntia fragilis. H. G.
Opuntia frutescens. G.
Opuntia fulgida. G.
Opuntia Greggii. G.
Opuntia humifusa. H.
Opuntia Kleiniae. G.
Opuntia leucotricha. G.
Opuntia microdasys. G.
Opuntia microdasys rubida. G.
Opuntia nigricans. G.
Opuntia Opuntia. H.
Opuntia polyacantha. G. H.
Opuntia polyacantha albospina. H.
Opuntia prolifera. G.
Opuntia rufescens. G.
Opuntia rutila. G.
Opuntia serpentina. G.
Opuntia Tuna. G.
Opuntia sp. G.
Opuntia sp. Mexico. G.
Opuntia sp. Mexico. G.
Opuntia No. 1. G.
Opuntia No. 2. Arizona. G.
Opuntia No. 3. Arizona. G.
Opuntia No. 5. California. G.
Opuntia No. 6. G.
Opuntia sp. G.
Opuntia sp. G.

Opuntia sp. G.
Opuntia sp. G.
Opuntia sp. G.
Opuntia sp. G.
Opuntia sp. G.
Opuntia sp. G.
Opuntia sp. G.
Orchis Atlantica. H.
Orchis coriophora. H.
Orchis fusca. H.
Orchis incarnata. H.
Orchis latifolia. H.
Orchis maculata. H.
Orchis mascula. H.
Orchis militaris. H.
Orchis Morio. H.
Orchis pallens. H.
Orchis pyramidalis. H.
Orchis sambucina. H.
Orchis sambucina incarnata. H.
Origanum vulgare. W. N. H.
Ornithogalum umbellatum. H. W.
Oryzopsis asperifolius. H.
Orobus vernus. H.
Osmunda cinnamomea. W.
Osmunda regalis. H.
Ostrya Virginiana. N.
Oxalis corniculata. W. H.
Oxalis cymosa. W.
Oxalis grandis. H.
Oxalis violacea. H.
Oxalis sp. H.
Oxalis sp. Mexico G.
Oxydendron arboreum. B.
Paeonia sp. H.
Paeonia, double mixed. N.
Paeonia, single mixed. N.
Panax quinquefolia. H.
Panax trifolia. W. H.
Panicularia Americana. H.
Panicularia brachyphylla. W.
Panicularia Canadensis. W. H.
Panicularia fluitans. W.
Panicularia nervata. W. H.
Panicularia pallida. W.
Panicum agrostoides. W.
Panicum Atlanticum. W. H.
Panicum barbulatum. W. H.
Panicum capillare. W.
Panicum capillare Gattingeri. W.
Panicum clandestinum. W. H.
Panicum Columbianum. W. H.
Panicum commutatum. H.
Panicum commutatum minor. W. H.
Panicum Crus-galli. H. W.
Panicum depauperatum. W. H.
Panicum dichotomum. W. H.
Panicum effusum. H.
Panicum elongatum. W.
Panicum laxiflorum. H.
Panicum linearifolium. W. H.
Panicum macrocarpon. W. H.
Panicum miliaceum. W.
Panicum minus. W.
Panicum polyanthes. H.
Panicum Porterianum. W. H.
Panicum proliferum. W.
Panicum pubescens. W. H.
Panicum Scribnerianum. H.
Panicum sphaerocarpon. W. H.
Panicum sphagnicolum. H.
Panicum Texanum. H.
Panicum virgatum. H.
Panicum Walteri. W.
Panicum sp. H.
Papaver Argemone. H.
Papaver glaucum. H.
Papaver laevigatum. H.
Papaver nudicaule. H.
Papaver orientale. H.
Papaver Rhoeas. H.
Papaver Rhoeas latifolia. H.
Papaver somniferum. H.
Parietaria officinalis. H.
Paris quadrifolia. H.
Parnassia Caroliniana. BG.
Parosela Lagopus. H.
Parsonsia lanceolata. H.
Parthenium integrifolium. H.
Parthenocissus quinquefolia. W. N.
Paspalum difforme. H.
Paspalum dilatatum. H.
Paspalum setaceum. W.
Passiflora incarnata. G.
Passiflora sp. Mexico. G.
Paulownia tomentosa. B.
Pedicularis Canadensis. W.
Pedicularis lanceolata. W.
Pelargonium sp. G.
Pellaea atropurpurea. H.
Peltandra Virginica. W.
Penthorum sedoides. W.
Pentstemon acuminatus. H.
Pentstemon barbatus. H.
Pentstemon campanulatus. H.
Pentstemon canescens. H.
Pentstemon coeruleus. H.
Pentstemon dentatus Torreyi. H.

Pentstemon Digitalis. H.
Pentstemon glaber. H.
Pentstemon Hartwegii. H.
Pentstemon hastatus. H.
Pentstemon ovatus. H.
Pentstemon puniceus. H.
Pentstemon Richardsonii. H.
Pentstemon violaceus. H.
Peramium repens. Planted.
Pereskia Bleo. G.
Perezia multiflora. H.
Pereskia sp. G.
Petasites palmata. H.
Petasites Petasites. H.
Petunia nyctaginiflora. N.
Peucedanum sativum. H.
Peucedanum verticillare. H.
Phacelia bipinnatifolia. H.
Phacelia dubia. H.
Phacelia tanacetifolia. H.
Phaius grandiflorus. G.
Phaius sp. G.
Phalaenopsis sp. G.
Phalaris arundinacea. W.
Phalaris arundinacea picta. H. N.
Phaseolus aconitifolius. H.
Phaseolus aureus. H.
Phaseolus multiflorus. H.
Phaseolus Mungo. H.
Phaseolus pilosus. H.
Phaseolus Ricciardianus. H.
Phegopteris Dryopteris. H.
Phegopteris hexagonoptera. W. H.
Phellodendron Amurense. N. B.
Phellodendron Japonicum. N.
Philadelphus coronarius. B.
Philadelphus grandiflorus. N. B.
Philadelphus sp. N.
Philadelphus sp. N.
Philadelphus sp. Japan. N.
Philadelphus sp. Japan. N.
Phleum pratense. W. H.
Phlomis tuberosa. H.
Phlox amoena. H.
Phlox Douglassii. H.
Phlox glaberrima. H.
Phlox maculata. N.
Phlox ovata. H.
Phlox paniculata. H.
Phlox pilosa. H.
Phlox subulata. H.
Phoenix reclinata. G.
Photinia villosa. N. B.
Phryma Leptostachya. W.
Phyllocactus albus superbus. G.
Phyllocactus anguliger. G.
Phyllocactus crenatus. G.
Phyllocactus Jenkinsonii. G.
Phyllocactus roseus superbus. G.
Phyllocactus superbus. G.
Phyllocactus sp. G.
Phyllocactus sp. G.
Phyllocactus sp. G.
Phyllocactus sp. G.
Phyllocactus sp. G.
Phyllocactus sp. G.
Physalis Peruviana. H.
Physalis sp. H.
Physaria didymocarpa. H.
Phytolacca acinosa esculenta. H.
Phytolacca decandra. W. H.
Piaropus coerulea. G.
Picris Dahurica. H.
Picris echioides. H.
Pilocereus fossulatus. G.
Pilocereus senilis. G.
Pimpinella magna. H.
Pinus Austriaca. B.
Pinus Strobus. W.
Pisum elatius. H.
Planera cuspidata. N.
Planera Kiaki. N. B.
Planera Richardi. N.
Plantago arachnoides. H.
Plantago arenaria. H.
Plantago cordata. H.
Plantago Cynops. H.
Plantago lanceolata. W. H.
Plantago Oreades. H.
Plantago Psyllium. H.
Plantago Rugelii. W. H.
Plantago Virginica. H.
Platanus occidentalis. W. N.
Platanus orientalis. B.
Platycerium alcicorne. G.
Platycodon grandiflorum. H.
Platycodon grandiflorum Mariesii. H.
Pleione sp. G.
Plumbago Larpentae. H.
Poa alpina. H.
Poa annua. W. H.
Poa brevifolia. H.
Poa caesia. H.
Poa compressa. W. H.
Poa flava. W.
Poa nemoralis. H.
Poa Nevadensis. H.

Poa pratensis. W. H.
Podolepis acuminata. H.
Podophyllum peltatum. H.
Polemonium coeruleum. H.
Polemonium coeruleum album. H.
Polemonium Himalayanum. H.
Polemonium Van Bruntiae. H.
Polygala paucifolia. H.
Polygala Senega. H.
Polygala verticillata. W.
Polygonatum biflorum. H.
Polygonatum commutatum. W. H.
Polygonatum multiflorum. H.
Polygonatum Polygonatum. H.
Polygonatum verticillatum. H.
Polygonum aviculare. H. W.
Polygonum compactum. H.
Polygonum Convolvulus. W. H.
Polygonum emersum. H.
Polygonum Persicaria. W. H.
Polygonum Sachalinense. H.
Polygonum sagittatum. W.
Polygonum Virginianum. W. H.
Polygonum Zuccarinii. H.
Polymnia Canadensis. H.
Polypodium aureum. G.
Polypodium vulgare. W.
Polypogon Monspeliensis. H.
Polystichum. G.
Pontederia cordata. W.
Populus alba. W.
Populus balsamifera candicans. B.
Populus fastigiata. B. N.
Populus grandidentata. W. N.
Populus heterophylla. BG.
Populus monilifera. B.
Populus tremuloides. W. N.
Porteranthus trifoliatus. H.
Potentilla alpestris. H.
Potentilla Anserina. H.
Potentilla argentea. H.
Potentilla argentea x verna. H.
Potentilla atrosanguinea. H.
Potentilla Canadensis. H.
Potentilla collina. H.
Potentilla digitata x flabellata. H.
Potentilla fruticosa. N. B. H.
Potentilla glandulosa. H.
Potentilla gracilis. H.
Potentilla hybrida. H.
Potentilla heptaphylla. H.
Potentilla hirta. H.
Potentilla Kotschyana. H.
Potentilla Kurdica. H.
Potentilla laciniata. N.
Potentilla Monspeliensis. H.
Potentilla Montenegrina. H.
Potentilla Pennsylvanica. H.
Potentilla Pennsylvanica arachnoides. H.
Potentilla pumila. W. H.
Potentilla recta laciniata. H.
Potentilla rupestris. H.
Potentilla simplex. W.
Potentilla Sinensis. H.
Potentilla tridentata. H.
Potentilla sp. H.
Potentilla sp. H.
Primula auricula. H.
Primula "Crux de Malta." H.
Primula lilacina. H.
Primula Parryi. H.
Prunella grandiflcra rubra. H.
Prunella vulgaris. W. H.
Prunus acida. N.
Prunus Allegheniensis. N.
Prunus Americana. N.
Prunus Armeniaca. N.
Prunus Avium. W. N.
Prunus Avium multiplex. N.
Prunus Besseyi. N.
Prunus divaricata. N.
Prunus Japonica. B.
Prunus mirobolana. N.
Prunus nigra. N.
Prunus Padus. N.
Prunus Pennsylvanica. N. B.
Prunus Persica. N.
Prunus Pissardi. N. B.
Prunus pseudocerasus. N.
Prunus pseudocerasus fl. rosea pl. N.
Prunus serotina. W.
Prunus Simonii. N.
Prunus spinosa. N.
Prunus Virginiana. N. B.
Prunus sp. N.
Prunus sp. N.
Prunus sp. N.
Prunus sp. N.
Prunus sp. N.
Psuedotsuga taxifolia pendula. N.
Psidium lucidum. G.
Psidium sp. G.
Psoralea macrostachya. H.
Psoralea Onobrychis. H.
Psoralea physodes. H.
Ptelea trifoliata. N. B.
Pteris cretica. G.

Pteris hastata. G.
Pteris serrulata. G.
Pteris serrulata cristata. G.
Pterostyrax hispidum. N.
Pulicaria dysenterica. H.
Pulsatilla hirsutissima. H.
Pulsatilla Pulsatilla. H.
Punica sp. G.
Pyrethrum lacustre. H.
Pyrethrum uliginosum. H.
Pyrola elliptica. W. H.
Pyrola rotundifolia. H.
Pyrola secunda. H.
Pyrus baccata. N.
Pyrus baccata edulis. N.
Pyrus baccata sinuata. N.
Pyrus baccata var. N.
Pyrus baccata var. N.
Pyrus baccata (extra large white-flowered). N.
Pyrus betulifolia. N.
Pyrus Japonica. B.
Pyrus microcarpa. N.
Pyrus Parkmanni. B.
Pyrus prunifolia. N.
Pyrus prunifolia flava. N.
Pyrus prunifolia intermedia. N.
Pyrus prunifolia macrantha. N.
Pyrus rivularis. N.
Pyrus spectabilis. fl. pl. N.
Pyrus Toringo. N.
Pyrus sp. N.
Pyrus sp. N.
Pyrus sp. N.
Pyrus sp. N.
Quercus alba. W.
Quercus Cerris. N. B.
Quercus glandulifera. N.
Quercus grosse-serrata. N.
Quercus humilis. N.
Quercus imbricaria. N. B.
Quercus macrocarpa. N.
Quercus Michauxii. N. B.
Quercus nigra. N.
Quercus obtusiloba. N.
Quercus palustris. W.
Quercus Phellos. N. B.
Quercus platanoides. W. N.
Quercus prinoides. N.
Quercus Prinus. B.
Quercus robur. B.
Quercus rubra. W.
Quercus velutina. W.
Quercus sp. N.
Ranunculus abortivus. W. H.
Ranunculus acris. W. H.
Ranunculus Allegheniensis. H.
Ranunculus bulbosus. W. H.
Ranunculus hispidus. W. H.
Ranunculus obtusiusculus. W.
Ranunculus recurvatus. W. H.
Ranunculus septentrionalis. W. H.
Ranunculus trilobus. H.
Ratibida columnaris. H.
Reseda glauca. H.
Reseda lutea. H.
Reseda luteola. H.
Rhamnus alnifolius. N.
Rhamnus alpinus. B.
Rhamnus Caroliniana. N. B.
Rhamnus cathartica. N.
Rhamnus crenulata. N.
Rheum undulatum. H.
Rheum Webbianum. H.
Rhexia Virginica. BG.
Rhipsalis Cassytha. G.
Rhipsalis pachyptera. G.
Rhipsalis paradoxa. G.
Rhipsalis salicornioides. G.
Rhododendron Vaseyi. N.
Rhodora Canadensis. BG.
Rhodotypos kerrioides. B.
Rhus aromatica. N. B.
Rhus copallina. N.
Rhus glabra. W.
Rhus hirta. N.
Rhus Osbeckii. N.
Rhus radicans. W.
Rhynchosia erecta. G.
Rhynchosia sp. G.
Ribes aureum. B.
Ribes Cynosbati. N.
Ribes Diacantha. N.
Ribes fasciculatum Chinense. N.
Ribes floridum. N. B.
Ribes floridum var. N.
Ribes oxyacanthoides. N.
Ribes sanguineum. N.
Richardsonia pilosa. H.
Ricinus communis. H.
Robinia hispida. N.
Robinia pseudacacia. W.
Robinia viscosa. N.
Rochea falcata. G.
Rochea sp. G.
Roripa palustris. W. H.
Rosa blanda. N.

Rosa Carolina. W.
Rosa cinnamomea. N.
Rosa humilis. W.
Rosa multiflora. N.
Rosa rubiginosa. N.
Rosa setigera. N.
Rosa Wichuraiana. H.
Rubus Canadensis. W.
Rubus deliciosus. N.
Rubus fruticosus. N.
Rubus neglectus. N.
Rubus Nutkanus. H.
Rubus occidentalis. W.
Rubus odoratus. N.
Rubus villosus. W.
Rudbeckia hirta. W.
Rudbeckia laciniata. W. H. N.
Rudbeckia maxima. H.
Rudbeckia speciosa. N.
Rudbeckia subtomentosa. H.
Rudbeckia triloba. H. N.
Ruellia ciliosa. H.
Ruellia strepens. H.
Rumex Acetosella. W.
Rumex altissimus. H.
Rumex Brownii. H.
Rumex crispus. W. H.
Rumex hymenosepalus. H.
Rumex obtusifolius. W. H.
Rumex Patientia. H.
Rumex roseus. H.
Rumex salicifolius. H.
Rumex verticillatus. H.
Rumex vesicarius. H.
Ruta graveolens. H. N.
Sabal Blackburnianum. G.
Sabal Palmetto. G.
Sabbatia chloroides. BG.
Salix alba vitellina. N.
Salix amygdaloides. N.
Salix Ansoniana. N.
Salix Babylonica. B.
Salix Basfordiana. N.
Salix cotinifolia. N.
Salix discolor. W.
Salix nigra. W.
Salix petiolaris. W.
Salix sericea. W. N.
Salix tristis. N.
Salix sp. N.
Salix sp. N.
Salix sp. N.
Salix sp. N.
Salix sp. N.
Salsola Kali. H.
Salvia argentea. H.
Salvia clandestina. H.
Salvia Columbariae. H.
Salvia glutinosa. H.
Salvia Japonica bipinnata. H.
Salvia lyrata. H.
Salvia nemorosa. H.
Salvia Pitcheri. H. N.
Salvia pratensis. H.
Salvia splendens. H.
Salvia tiliaefolia. H.
Salvia verbenacea. H.
Salvia verbenacea rubella. H.
Salvia verticillata. N.
Salvia viscosa. H.
Sambucus Canadensis. W. N.
Sambucus laciniatus. N.
Sambucus pubens. N.
Sanguinaria Canadensis. H.
Sanguisorba Canadensis. H.
Sanguisorba Sanguisorba. H.
Sanguisorba tenuifolia. H.
Sanicula Canadensis. W.
Sanicula gregaria. W. H.
Sansevieria zebrina. G.
Santolina incana. H. N.
Sapindus marginatus. N.
Saponaria officinalis. W. H.
Saracha Jaltomata. H.
Sarothra gentianoides. W.
Sassafras Sassafras. W.
Saururus cernuus. W.
Savastana odorata. H.
Saxifraga cordifolia. H.
Saxifraga peltata. H.
Saxifraga Pennsylvanica. H.
Saxifraga Virginiensis. W. H.
Scabiosa arvensis. H.
Scabiosa australis. H.
Scabiosa brachiata. N.
Scabiosa Columbaria. H.
Scabiosa Fischeri. H.
Scabiosa graminifolia. H.
Scabiosa gramuntia. H.
Scabiosa isetensis. N.
Scabiosa maritima. H.
Scabiosa plumosa. H.
Scabiosa prolifera. H.
Scabiosa Succisa. H.
Scabiosa vestina. H.
Scandix Balansae. H.
Scandix Pecten-Veneris. H.
Schizanthus pinnatus. H.

Scirpus atrovirens. W. H.
Scirpus lacustris. W.
Scirpus microcarpus. H.
Scirpus planifolius. W.
Scleranthus annuus. W. H.
Sclerocarpus uniserialis. H.
Scolopendrium Scolopendrium. H
Scorpiurus muricata. H.
Scorpiurus subvillosa. H.
Scorpiurus vermiculata. H.
Scrophularia alata. H.
Scrophularia aquatica. H.
Scrophularia leporella. W. H.
Scrophularia Marylandica. W.
Scrophularia Scorodonia. H.
Scutellaria alpina. H.
Scutellaria lateriflora. W.
Secale cereale. H.
Securigera Coronilla. H.
Sedum acre. H.
Sedum aureum. G.
Sedum Ewersii. H.
Sedum hybridum. H.
Sedum Japonicum. H.
Sedum Maximowiczii. H.
Sedum Nevii. H.
Sedum nudiflorum. N.
Sedum sexangulare. H.
Sedum spectabile. H.
Sedum spectabile album. H.
Sedum telephioides. H.
Sedum Telephium. H.
Sedum ternatum. G.
Sedum sp. G.
Sedum sp. G.
Selaginella rupestris. W.
Sempervivum arachnoideum var. H.
Sempervivum cuneatum. H.
Sempervivum tectorum. H.
Senecio aureus. W. H.
Senecio Balsamitae. H.
Senecio diversifolius. H.
Senecio elegans. H.
Senecio Smallii. H.
Senecio thyrsoides. H.
Senecio viscosus. H.
Senecio sp. H.
Senecio sp. Mexico. G.
Serratula coronata. H.
Serratula coronata macrophylla. H.
Sesamum Indicum. N.
Seseli gummiferum. H.
Seseli osseum. H.
Sherardia arvensis. H.
Sicyos angulatus. W.
Sida carpinifolia. G.
Sida Napaea. H.
Sida rhombifolia.? G.
Sida spinosa. N.
Sidalcea candida. H.
Sieglingia seslerioides. W. H.
Silene Armeria. H. N.
Silene Caroliniana. W. H.
Silene Choulettii. H.
Silene clandestina. H.
Silene colorata. H.
Silene diurniflora. H.
Silene echinata. H.
Silene Gallica. H.
Silene glauca. H.
Silene linaeola. H.
Silene longiflora. H.
Silene maritima. H.
Silene noctiflora. H.
Silene nocturna micrantha. H.
Silene pendula. H.
Silene Pennsylvanica. H.
Silene rubella. H.
Silene stellata. W. H.
Silene stylosa. H.
Silene undulata. H.
Silene Virginica. H.
Silphium perfoliatum. H.
Silphium scaberrimum. H.
Silphium terebinthinaceum. H.
Silphium trifoliatum. H.
Sisymbrium Austriacum. H.
Sisymbrium tanacetifolium. H.
Sisyrinchium albidum. H.
Sisyrinchium angustifolium. W. H.
Sisyrinchium Atlanticum. H.
Sisyrinchium graminoides. H.
Sisyrinchium mucronatum. H.
Sisyrinchium striatum. H.
Sitilias Caroliniana. N.
Smilax herbacea. W.
Smilax rotundifolia. W.
Solanum Dulcamara. W. H.
Solanum heterodoxum. H.
Solanum sisymbriifolium. H.
Solanum villosum. H.
Solidago arguta. H.
Solidago bicolor. W.
Solidago Boottii. H.
Solidago caesia. W. H.
Solidago Canadensis. W. H.
Solidago elongata. H.
Solidago flexuosa. H.

Solidago juncea. W. H.
Solidago nemoralis. W. H.
Solidago patula. W. H.
Solidago Riddellii. H. N.
Solidago rigida. H. N.
Solidago rugosa. W. H.
Solidago serotina. W.
Solidago speciosa. H.
Solidago stricta. G.
Sophora angustifolia. H.
Sophora Japonica. N. B.
Sophora violacea. B.
Sorbus Americana. B.
Sorbus Aucuparia. N. B.
Sorghum vulgare. H.
Sparganium eurycarpum. W.
Spartina cynosuroides. H.
Spathyema foetida. W.
Spiraea Amurensis. N.
Spiraea Billardii. B.
Spiraea Bumalda. B.
Spiraea callosa. B.
Spiraea carpinifolia. B.
Spiraea chamaedrifolia. B.
Spiraea cuneifolia. B.
Spiraea filipendula. H. N.
Spiraea Hookeri. B.
Spiraea palmata. H. N.
Spiraea Reevesiana. B.
Spiraea Regeliana. B.
Spiraea rotundifolia. B.
Spiraea salicifolia. B.
Spiraea sorbifolia. N.
Spiraea Thunbergii. B.
Spiraea tomentosa. B.
Spiraea tomentosa alba. N.
Spiraea vaccinifolia. B.
Spiraea sp. N.
Sporobolus vaginaeflorus. W.
Stachys aspera. H.
Stachys Betonica. H.
Stachys Betonica alba. H.
Stachys Germanica. H.
Stachys hyssopifolia. H.
Stachys lanata. H.
Stachys palustris. H.
Stachys setifera. H.
Stachys sylvatica. H.
Stapelia grandiflora. G.
Stapelia variegata. G.
Stapelia sp. G.
Stapelia sp. G.
Staphylea Bumalda. N.
Staphylea Colchica. N. B.
Staphylea trifolia. W. B.
Statice maritima. H.
Statice plantaginea. H.
Steironema ciliatum. W. H.
Stephanandra flexuosa. B.
Stevia Eupatoria. H.
Stevia serrata. G.
Stipa aristella. H.
Stokesia cyanea. H.
Strelitzia gigantea. G.
Strelitzia Reginae. G.
Strophostyles helvola. H.
Struthiopteris Struthiopteris. H.
Stylophorum diphyllum. H.
Styrax Japonica. N.
Swertia perennis. H.
Symphoricarpos racemosa. B.
Symphoricarpos Symphoricarpos. B. N.
Syndesmon thalictroides. W. H.
Syntherisma filiformis. W.
Syntherisma linearis. W.
Syntherisma sanguinalis. W.
Syringa Emodi. B.
Syringa Japonica. N.
Syringa ligustrina. B.
Syringa Pekinensis. N.
Syringa villosa. N. B.
Syringa vulgaris. W.
Syringa vulgaris alba. N.
Syringa vulgaris, Count de Choisie. N.
Syringa vulgaris hyacinthiflora. N.
Syringa vulgaris, Senatus Voland. N.
Tagetes patula. H.
Tagetes pusilla. H.
Tamarix Africana. N.
Tamarix Gallica. B. N.
Tamarix Indica. N. B.
Tanacetum Huronense. H.
Taraxacum erythrospermum. W. H.
Taraxacum Taraxacum. W. H.
Taxodium distichum. B.
Taxus Canadensis. N.
Taxus cuspidata. N.
Tecoma grandiflora. N.
Tecoma radicans praecox. N.
Tecoma sp. H.
Tecoma sp. N.
Tetragonia crystallina. H.
Tetragonia expansa. H.
Teucrium Botrys. H.
Teucrium Chamaedrys. H.
Teucrium Scorodonia crispa. H.

Thalesia uniflora. W. H.
Thalictrum angustifolium. H.
Thalictrum aquilegifolium. H.
Thalictrum coriaceum. H.
Thalictrum glaucum. H.
Thalictrum minus concinnum. H.
Thalictrum minus elatum. H.
Thalictrum minus purpurascens. H.
Thalictrum polygamum. W. H.
Thalictrum squarrosum. H.
Thalictrum sp. H.
Thelesperma filifolium. H.
Thermopsis Caroliniana. N. H.
Thermopsis montana. H.
Thermopsis rhombifolia. H.
Tiarella cordifolia. H.
Tilia Americana. B.
Tilia cordata Japonica. N.
Tilia Europaea. B.
Tilia platyphylla. B.
Tillandsia sp. G.
Tinantia fugax. H.
Tolpis barbata. H.
Toxylon pomiferum. Planted.
Trachymene pilosa. H.
Tradescantia reflexa. H.
Tradescantia Virginica. H.
Trichosanthes anguina. H.
Trichosma suavis. G.
Trichostema dichotomum. W.
Tridax trilobata. H.
Trifolium agrarium. W.
Trifolium angustifolium. H.
Trifolium hybridum. H.
Trifolium incarnatum. H.
Trifolium pratense. W. H.
Trifolium repens. W. H.
Trifolium Virginicum. H.
Trigonella Balansae. H.
Trigonella coerulea. H.
Trigonella Cretica. H.
Trigonella Foenum-graecum. H.
Trigonella ovalis. H.
Trillium cernuum. W. H.
Trillium erectum. H.
Trillium grandiflorum. H.
Trillium recurvatum. H.
Trillium sessile. H.
Trinia Kitaibelii. H.
Triosteum angustifolium. H.
Triosteum perfoliatum. H.
Tripsacum dactyloides. H.
Triticum monococcum. H.
Trollius Asiaticus. H.
Trollius Europaeus. H.
Trollius laxus. BG.
Tropaeolum aduncum. H.
Tropaeolum majus. H.
Tropaeolum minus. H.
Tsuga Canadensis. W.
Tunica Olympica. H.
Tunica prolifera. H.
Tunica Saxifraga. H.
Tussilago Farfara. H. N.
Typha latifolia. W.
Ulmaria Ulmaria. H.
Ulmus alata. N.
Ulmus Americana. W.
Ulmus campestris. N.
Ulmus crassifolia. N.
Ulmus racemosa. B.
Ulmus Sibirica. N.
Ulmus Sinensis. N.
Unifolium bifolium. H.
Unifolium Canadense. H.
Uropappus leurocarpus. H.
Urospermum picroides. H.
Ursinia pulchra. H.
Urticastrum divaricatum. H.
Urtica gracilis. H.
Uvularia grandiflora. H.
Uvularia sessilifolia. H. W.
Vaccinium corymbosum. B.
Vaccinium stamineum. N.
Vaccinium vacillans. W.
Vagnera racemosa. W. H.
Vagnera stellata. H.
Valeriana officinalis. H.
Valerianella dentata. H.
Valerianella eriocarpa. H.
Vancouveria hexandra. H.
Veratrum album. H.
Veratrum viride. BG. H.
Verbascum Blattaria. H.
Verbascum Cedreti. H.
Verbascum malacotrichum. H.
Verbascum nigrum. H.
Verbascum Phoeniceum. H.
Verbascum speciosum. H.
Verbena angustifolia. H.
Verbena Aubletia. H.
Verbena biserrata. H.
Verbena Bonariensis. N.
Verbena hastata. H.
Verbena stricta. H.
Verbena urticifolia. W.
Verbena venosa. H.
Verbena.? G.

Verbesina alternifolia. H.
Verbesina helianthoides. H.
Vernonia Arkansana. H.
Vernonia Noveboracensis. W.
Veronica Buxbaumii. H.
Veronica Chamaedrys. W. H.
Veronica exaltata. H.
Veronica imperialis. G.
Veronica longifolia subsessilis. H.
Veronica officinalis. H. W.
Veronica pectinacea. H.
Veronica peregrina. W.
Veronica rupestris. H.
Veronica serpyllifolia. W. H.
Veronica spicata. H.
Veronica spicata variegata. H.
Viburnum acerifolium. W. B.
Viburnum cassinoides. BG. B.
Viburnum cotinifolium. N.
Viburnum dentatum. W. N.
Viburnum dilatatum. N.
Viburnum Lantana. B.
Viburnum Lentago. W. B.
Viburnum molle. N.
Viburnum Nepalense. N.
Viburnum nudum. BG.
Viburnum Opulus. N. B.
Viburnum Opulus nana. N.
Viburnum phlebotrichum. N.
Viburnum plicatum. B.
Viburnum prunifolium. W.
Viburnum Sieboldi. N.
Vicia arguta. H.
Vicia Bithynica. H.
Vicia calcarata. H.
Vicia Cracca. H.
Vicia disperma. H.
Vicia Faba. H.
Vicia Faba equina. H.
Vicia Narbonensis. H.
Vicia sativa. H.
Vicia tetrasperma. W.
Vicia varia. H.
Vicia villosa. H.
Vinca minor. W.
Vinca rosea. H.
Vincetoxicum obliquum. H.
Viola Atlantica. H.
Viola blanda. W. H.
Viola blanda amoena. W. H.
Viola cucullata. W. H.
Viola emarginata. H.
Viola Labradorica. W. H.
Viola lanceolata. H.
Viola obliqua. W. H.
Viola obliqua (garden form). H.
Viola ovata. W. H.
Viola palmata. W. H.
Viola pedata. W. H.
Viola pedata alba. H.
Viola pedata bicolor. H.
Viola Porteriana. H.
Viola primulaefolia. H.
Viola rostrata. H.
Viola rotundifolia. W. H.
Viola sagittata. H.
Viola scabriuscula. W. H.
Viola sororia. W. H.
Viola striata. H.
Viola sylvestris. H.
Viola tricolor. H. N.
Viola villosa. H.
Viscaria splendens. H.
Vitex Agnus-castus. N.
Waldsteinia fragarioides. H.
Washingtonia Claytoni. W. H.
Weigela amabilis. B.
Weigela Desboisii. B.
Weigela floribunda. B.
Weigela rosea. B.
Willughbaea scandens. W.
Wistaria Sinensis. N.
Woodwardia radicans. G.
Wulfenia Houghtoniana. H.
Xanthium spinosum. H.
Xanthocephalum gymnospermoides. N.
Xanthoceras sorbifolia. N.
Xanthorrhiza apiifolia. N. B.
Xanthoxylum Americanum. N.
Xanthoxylum piperitum. N.
Xeranthemum annuum. H.
Xolisma ligustrina. N.
Yucca angustifolia. H.
Yucca filamentosa. H.
Yucca rupicola. H.
Zamia integrifolia. G.
Zelkova crenata. N.
Zinnia aurea. H.
Zinnia elegans. H.
Zinnia Haageana. H.
Zizia aurea. H.
Zizia Bebbii. H.
Zizia cordata. H.
Ziziphora tenuior. H.
Zizyphus vulgaris. N.
Zygadenus elegans. H.
Zygopetalum Mackaii. G.

CONDENSED FINANCIAL STATEMENT.

From June 20th, 1895, to January 10th, 1898.

ENDOWMENT ACCOUNT.

Subscriptions received from		
Columbia University		$25,000.00
J. Pierpont Morgan		25,000.00
Andrew Carnegie		25,000.00
Cornelius Vanderbilt		25,000.00
John D. Rockefeller		25,000.00
D. O. Mills		25,000.00
Hon. Addison Brown		25,000.00
William E. Dodge		10,000.00
James A. Scrymser		10,000.00
William C. Schermerhorn		10,000.00
Mrs. Esther Herrman		10,000.00
Hon. Charles P. Daly		5,000.00
Oswald Ottendorfer		5,000.00
Samuel Sloan		5,000.00
George J. Gould		5,000.00
Helen M. Gould		5,000.00
John S. Kennedy		5,000.00
William Rockefeller		5,000.00
Arnold, Constable & Co.		5,000.00
Morris K. Jesup		2,500.00
Mrs. Melissa P. Dodge		1,000.00
Tiffany & Co.		1,000.00
Hon. Seth Low		1,000.00
H. C. von Post		1,000.00
Fred. F. Thompson		1,000.00
John Innes Kane		1,000.00
Hugh N. Camp		250.00
		$263,750.00
Deduct for Sundry Expenditures for Preliminary Surveys and for Competitive Plans for Museum Building, etc.		4,904.09
		$258,845.91
Invested in New York City 3 per cent. bonds @ par.	$153.000.00	
Plus 52 days accrued interest	653.91	
		153,653.91
Balance on hand, January 10, 1898.		$105,192.00

INCOME ACCOUNT.

Receipts.

Special contributions for purchase of the Ellis Collection of Fungi, as follows:		
Cornelius Vanderbilt.	$3,325.00	
Andrew Carnegie	2,325.00	
D. O. Mills.	1,000.00	
J. Pierpont Morgan.	1,000.00	
John D. Rockefeller	1,000.00	
James A. Scrymser.	500.00	
Seth Low.	250.00	
Samuel Sloan.	100.00	$9,500.00
Annual Membership Fees, to Jan. 11, 1897		$4,440.00
" " " " " 10, 1898		5,160.00
Proceed Sales of Hay.		251.82
Interest allowed by J. P. Morgan & Co. on Treasurer's Balance, 1895		679.04
Interest allowed by J. P. Morgan & Co. on Treasurer's Balance, 1896		5,301.37
Interest allowed by J. P. Morgan & Co. on Treasurer's Balance, 1897		3,103.56
Coupons due May 1, 1897, from $153,000 N. Y. City Bonds.		2,295.00
Coupons due Nov. 1, 1897.		2,295.00
J. B. McDonald, for rent of right-of-way for Temporary Railway		2,000.00
Interest from Subscribers to Endowment Fund on Deferred payments		230.12
		$35,255.91

Expenditures.

Paid J. B. Ellis for his Collection.	$8,500.00
Cost of Administration, Development, etc., under appropriations of 1895	675.08
Cost of Administration, Development, etc., under appropriations of 1896	8,526.28
Cost of Administration, Development, etc., under appropriations of 1897	13,868.01
	$31,569.37
Balance on hand Jan. 10, 1898.	$3,686.54

DESCRIPTION OF THE RANGE OF HORTICULTURAL HOUSES.

The range of Horticultural Buildings for the New York Botanical Garden will be made up of thirteen houses, covering an area, exclusive of cellar space, of about forty-five thousand square feet.

The central feature of the range is a palm house, circular in form, one hundred feet in diameter, and in height about ninety feet from the terrace level to the finial of the upper dome. From either side of this house, running east and west respectively, are two connecting wings, each divided into compartments; the dimensions of these wings being about thirty feet wide by one hundred and sixteen feet long. In height they are about twelve feet to cornice line and twenty-six to the ridge. At the ends are placed houses in the form of a cross, with lanterns on roofs, about eighty-four feet wide, sixteen feet high to main cornice, thirty-eight feet high to lantern cornice, and forty-six feet to ridge. Running south from these are two other low connecting houses, thirty feet by seventy-five feet each, at the ends of which are two square houses with cut corners, fifty feet in diameter, and thirty-five feet high to top of domes. Running east and west from these are two low houses with octagonal ends, in size about thirty-eight by one hundred and three feet each. The front elevation of the range is about five hundred feet in length; the side elevations are about two hundred and ten feet in length.

The houses enclose a large court, which is approached from the south. This court will be utilized for aquatic planting and other ornamental features. The main entrances are located on the north and south sides of the palm house, and have commodious inner vestibules. Auxiliary entrances are located at various other points, in the form of outer vestibules; thus ample entrance and exit facilities are provided for. Three of the houses have cellars under them, aggregating about eight thousand seven hundred feet of cellar space. These

cellars are thoroughly drained, lighted and ventilated, and are entered from the outside through a covered driveway; there are also entrances from the houses to them from the inside. The houses will stand upon a broad terrace, and will occupy a commanding position. The style is modernized Italian renaissance.

The buildings will be practically fireproof, being constructed mainly of iron and glass, resting on solid masonry. The only woodwork employed will be that which is necessary to form a proper setting for the glass, and to prevent undue expansion and contraction of the metal structural work. The outer facings of the foundation will be fine cut Bedford and Blue stone. The details of the exterior face of the superstructure will be carried out mainly in copper and cast iron. The sash in the sides of the palm house will be glazed with polished plate glass; all the other glazing will be done with double thick, clear and ground glass. The entire superstructure will be painted white, both inside and out.

The heating will be under perfect control, admitting of a temperature in every building of seventy degrees Fahrenheit during coldest weather. The radiating surfaces will be so valved that this temperature can be decreased and regulated at will. The heating mains will not be exposed in the houses, but will all be carried in underground trenches. The radiating coils will be so placed in the houses as to be readily concealed by banking the planting, thus allowing a natural treatment of the interior of the houses. The heating mains will be carried through an underground trench, from a central power house, located some six hundred feet from the extreme west end of the range. This will do away with the nuisance and unsightliness always incidental where the boiler power is placed in proximity to the houses.

The watering system will be comprehensive; two sets of mains for both hot and cold water will supply each combination hose bibb, so that hot and cold water can be drawn, or any variation between, at any point in the range. The system of ventilation will be ample and so arranged that conditions of temperature and humidity can be regulated to suit

the numerous requirements of different plants. The walks through the houses will be commodious, sinuous in the larger houses and straight in the smaller ones. The floor areas in the larger houses will be treated naturally, and vistas can be arranged from many points. Plant tables constructed with iron frames and slate tops will be placed in some of the smaller houses to accommodate the collections that will be grown in pots.

All the other various features entering into the houses have been perfected with a view of obtaining the greatest amount of durability, lightness of construction, beauty of outline and practicability from a horticultural standpoint. The large number of houses will allow a very diversified treatment of plant life.

The central palm house will accommodate the largest specimens of palms and other tropical plants, and the commodious interior will admit of a very effective natural treatment. The smaller connecting houses can be used to great advantage for the display and growth of various classes of plants; there being six of these compartments, a wide treatment can be employed. The large cross houses can be utilized to good purpose as a cool palm or fern house, and a house for the growth and display of tropical fruit and an economic collection and for various other uses. The two square dome houses can be used for a collection of cacti, etc. One of the thirty-eight feet by one hundred and three feet houses has a pond occupying the entire area, excepting for a border a few feet wide around the sides; this will provide for a fine display of aquatics. The other thirty-eight feet house will provide a display or exhibition house.

The foregoing outline description is only intended to convey a general impression as to the character and adaptability of the houses. The range as a whole will undoubtedly be the most thoroughly constructed and equipped of any in the country and will embrace such varied capabilities for diversified and broad treatment that it cannot but be a source of great pleasure and education to the people of New York and vicinity.

DESCRIPTION OF THE MUSEUM BUILDING.

The general building is to be about 308 feet long and has a depth of 50 feet, and provides halls on each story uniformly 46 feet wide, 18 feet high and about 85 feet long.

The plans allow for the construction of wings in the future, as shown in the accompanying design.

The building is designed in Italian Renaissance style in which regularity is confined to the two chief stories, where the main order of Corinthian pilasters and entablature about 40 feet in height is carried uniformly through all parts and thus gives unity to the edifice, while the upper story is made to appear in full effect only in the central mass and upon the flanking wings, the intermediate portions showing steep roofs with dormer windows. The order is limited to two stories because these are the chief portions of the structure and are thus appropriately marked in the external character, and because the upper story is thus left susceptible of freer and more varied treatment.

The central feature is crowned by the dome of the reading room rising somewhat higher than any other part and making a reposeful culmination of the height. The whole stands upon a basement which is partly masked by the approaches and terrace. Thus the apparent height is lessened and the sky line varied without injury to the utilitarian interior. The order of pillars gives bold scale to the building, with vertical lines effective at distances, and in harmony with the woodland surroundings. The detail will be academic and historical throughout. The materials are to be white brick and terra cotta which mature in a few months to a light gray most harmonious with the foliage surrounding.

The principal entrance is put at the first floor level so that all the public museum halls are within one flight of stairs up and one down. This is managed by forming a terrace along the main front of the building reached by an inclined approach and raised at the centre, half the height of the basement, and by keeping the basement down a little (without,

however, lowering any window sills below the ground level). Thus the main floor is reached without conscious climbing, while the basement preserves its proper height of story. At the ends the basement has entrances at the ground level where it is made coincident with the floor level.

The Lecture theatre to seat 800 persons is placed at the western intersection of the wings in the basement where it will be nearest the railway station and driveway and have the advantage of outside windows for light and ventilation. It is planned in an original way in an effort to avoid some usual defects. This theatre has six large exits to the open air direct and is also accessible from the general basement. All these doors are level with the ground outside without steps, so that an alarm can have no disastrous effects. The aisles widen as their duty increases, and they discharge upgrade. There are no columns; the floor overhead will be suspended from girders of double capacity in the second tier. Full height and good acoustics are secured by sinking the pit of the theatre below the normal basement level.

The central hall is repeated in the basement, and an exhibition hall extends on either side with very good daylight. The north windows are made of extraordinary size. There are several store rooms, etc., provided. Toilet rooms for both sexes are placed in the front and rear respectively of the basement where good daylight and ventilation are secured. The first and second stories are devoted to museum purposes and have each a combined area of about 19,000 sq. ft. The offices and board room are provided opposite the main entrance in the first story beyond the stairs. The central hall in each story is given to some architectural distinction by a circular colonnade; the space thus separated is available for certain exceptional exhibits of bold or bulky character without injuring the hall's utility as a focus of communication.

The main staircase, of ample proportions, easy and safe for the regulation of crowds, is opposite the entrance. It has a very large hallway landing where a few exhibits will serve to break the passage upward and where very large windows

flood the whole extent of the stair with daylight. This stair extends only to the second story which has museum halls similar to the first. From the second floor another stair extends to the third. Two elevators are provided, one for passengers and one for freight. Both elevators are close to the entrance so they can be reached by persons desiring an upper floor without first traversing the lower floor, and they give access equally to the museum department and to the students' department. On the third floor the hall is arranged on the front of the building in order to leave all of the north light on the rear part available for the laboratories. The library is made the central department with two subdivisions, the reading room under the dome, which is of glass, in its upper part, and the stack room or book room which is to the rear in the square central block. The remaining space of this story is devoted to work-rooms, class-rooms, laboratories, and herbariums. The herbarium and the library book room are well isolated so that fire in their combustible contents can be easily managed.

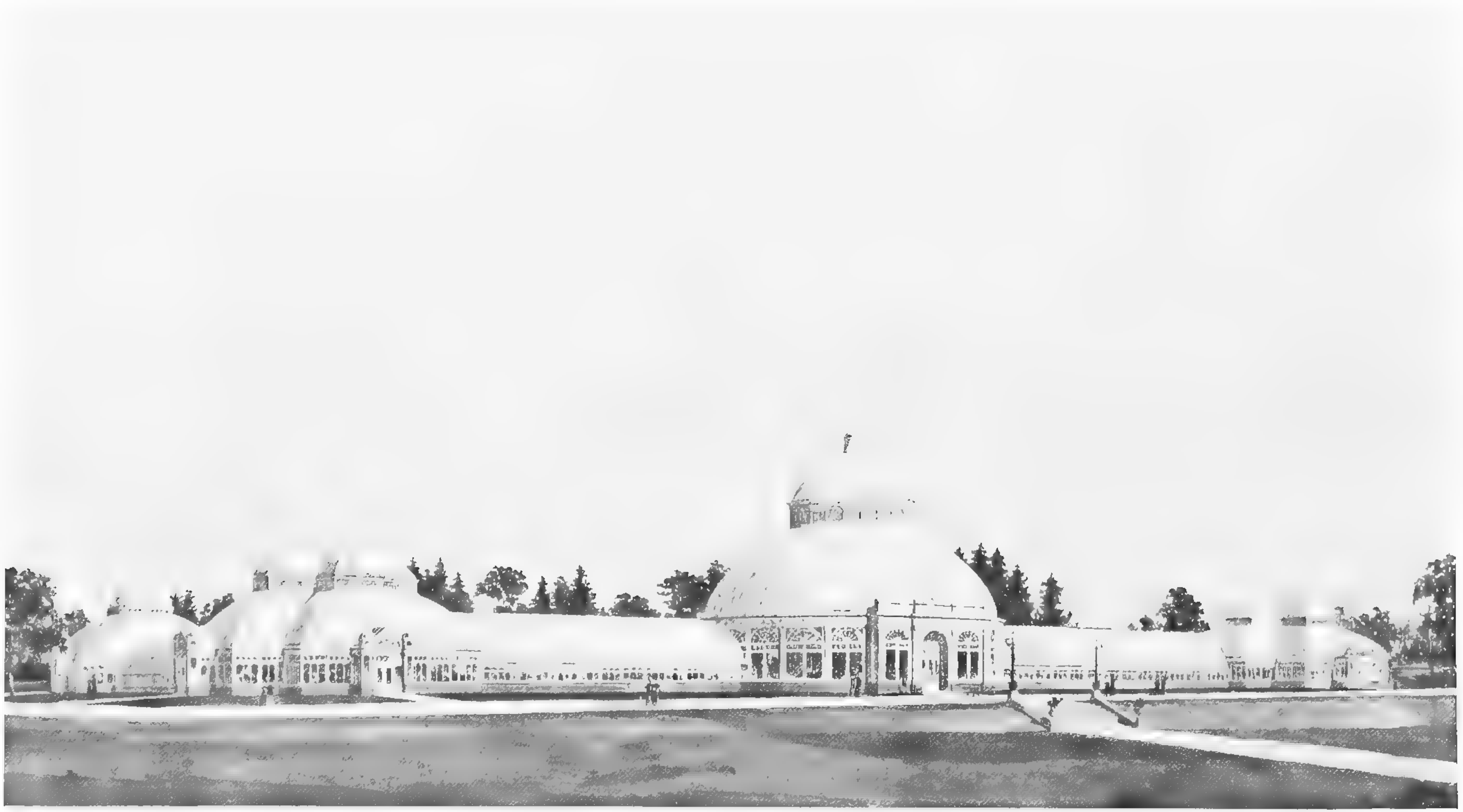
Fireproof qualities absolute and consistent will be provided not only in the construction but in the finish. In this design there is not to be used any combustible structure or finish whatever. The numerous wooden finishings found in most buildings of fireproof construction are banished, and the interior finish and furniture will be as nearly fireproof as possible so that not only the safety of the building structurally, but also the safety of each room and its contents will be assured. For the museum floors a composition of natural marble in mixture colors will be used, and the finish of walls and columns will consist of hard patent plaster. With such impervious floors and walls the comfort of persons is secured and, equally important, the impossibility of dampness prevents the lodgment of mildews and bacteria.

The ventilation throughout will be well secured partly by natural draft and partly by fans forcing currents of fresh air and exhausting foul air. Sanitary appliances will be the usual approved combinations of porcelain, marble and tile and

nickel-plated metal. Fire hose is provided at short intervals. Electric lighting with a system of interchangeable fixtures for walls and ceilings near windows will provide for artificial light partly from the same direction as the natural light.

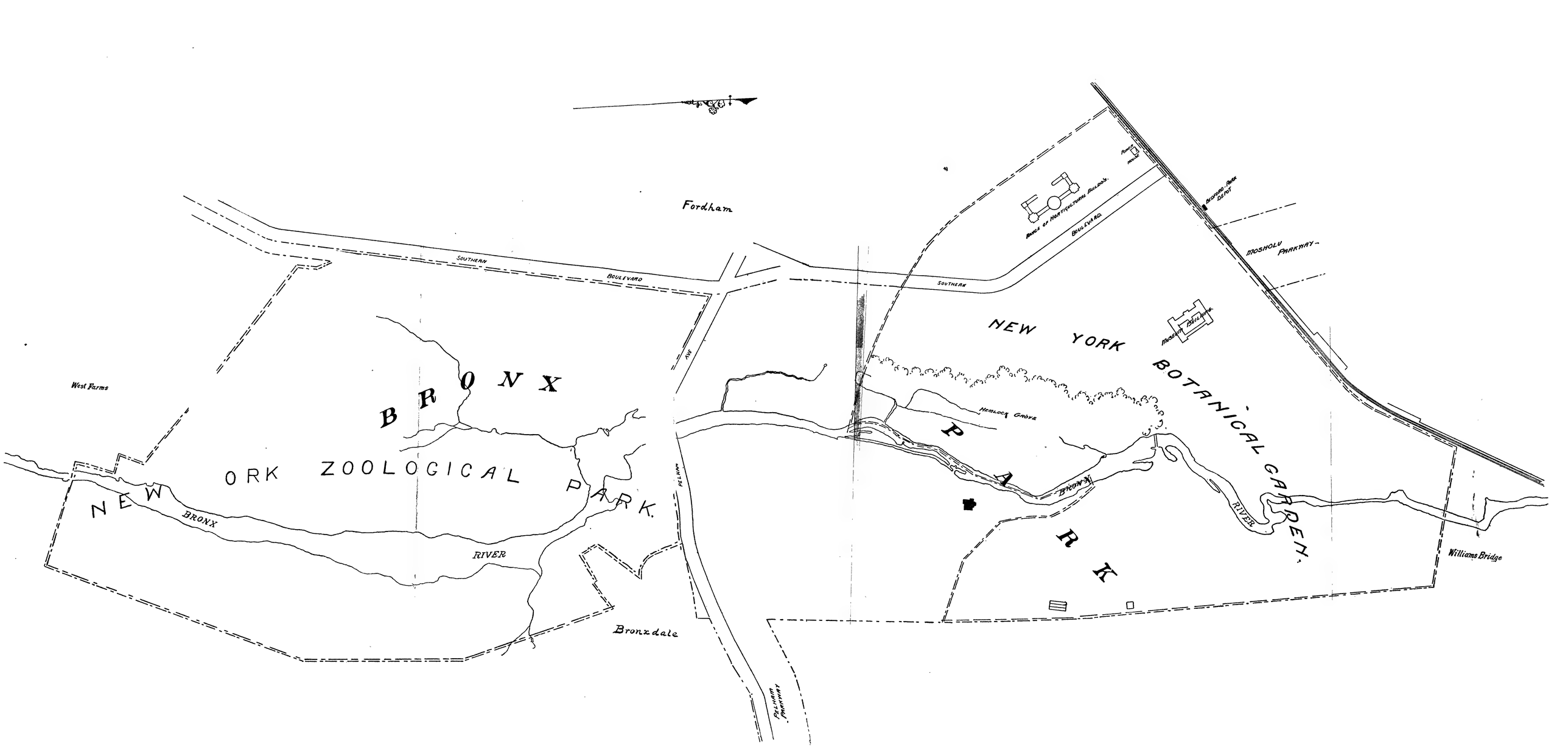
THE BOTANICAL MUSEUM.

FROM DESIGN BY R. W. GIBSON, ARCHITECT.



THE RANGE OF HORTICULTURAL HOUSES.

FROM DESIGN BY THE LORD AND BURNHAM CO., ARCHITECTS.


Fordham
SOUTHERN BOULEVARD
SOUTHERN BOULEVARD
West Farms
BRONX
ZOOLOGICAL PARK
NEW BRONX RIVER
Bronxdale
PELHAM AVE
PELHAM PARKWAY
RANGE OF HORTICULTURAL BUILDS.
BOULEVARD
BEDFORD PARK BLVD
MOSHOLU PARKWAY
NEW YORK BOTANICAL GARDEN
HEMLOCK GROVE
BRONX RIVER
Williams Bridge

VOL. I. NO. 4.

BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN.

CONTENTS:

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR 1898,. . . 171
APPENDIX 1. ACCESSIONS OF MATERIAL,. 185
APPENDIX 2. SCHEDULE OF EXPENDITURES DURING 1898 UNDER APPROPRIATIONS MADE BY THE BOARD OF MANAGERS,. . . 193
APPENDIX 3. LISTS OF PLANTS IN THE GROUNDS, 1898,. . . . 195
REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND ANNUAL MEMBERS, SUBMITTED JANUARY 9, 1899, INCLUDING LIST OF ANNUAL MEMBERS,. 243
REPORT OF THE HONORARY CURATOR OF THE ECONOMIC COLLECTIONS TO THE BOARD OF SCIENTIFIC DIRECTORS,. 252
BOTANICAL CONTRIBUTIONS:
DESCRIPTION OF A NEW STONECROP FROM MEXICO, BY N. L. BRITTON, ... 257
THE CESPITOSE WILLOWS OF ARCTIC AMERICA AND THE ROCKY MOUNTAINS, BY P. A. RYDBERG,. 257
UNDESCRIBED PLANTS OF THE SOUTHERN UNITED STATES, BY JOHN K. SMALL, ... 278
NEW GRASSES FROM THE SOUTHERN UNITED STATES, BY GEO. V. NASH, ... 290
REPRODUCTIONS OF PHOTOGRAPHS TAKEN WITHIN THE GROUNDS, PLATES 3–8, ... 295

[ISSUED APRIL 13, 1899.]

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BULLETIN

OF

The New York Botanical Garden

Vol. I. No. 4.

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF.

(Submitted January 9, 1899.)

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen: I have the honor to submit herewith my report as Secretary and Director-in-Chief for the year ending January 9, 1899.

Plants and Planting.

Herbaceous Grounds. The herbaceous collection has been much augmented during the year, mostly by plants grown from seed in the nurseries. As shown by the complete list appended to this report, there have been 2110 species and varieties, contained in 82 families, under cultivation during the season. This is a gain of nearly 700 species over the record for 1897. As was to be expected, some of those grown in that year proved to be not hardy in our climate, and a considerable number of annuals were not carried over, due either to failure of the plants to mature seed, or to failure of the seed to germinate.

During the autumn, excavations were made for two of the pools for aquatic plants in the Herbaceous Grounds; the re-

maining ones needed may be excavated in the spring, in time for the installation of the groups of aquatics which we have hitherto been unable to cultivate in positions where their botanical relations to other plants would be indicated.

Weeding and repeated mowing of the greensward between the beds have brought this to a very presentable appearance, and the wooded margins of the tract have been utilized for the planting of shade-loving species, for which they are so well adapted.

Fruticetum. The removal of shrubs from the nurseries and borders to the plain northeast of the Museum Building, set apart for the fruticetum, was begun in October, and by the end of the season 195 species had been installed, as shown by the list appended to this report. The plants have been grouped in natural families, with due consideration of the positions of future roads and paths, as provided in the General Plan, which contemplates a large amount of greensward between the plantations. As a rule only shrubs of considerable size have been moved into this collection; nearly as many more species, derived from seed or cuttings, remain in the nurseries for another year's growth.

Arboretum. The setting of trees, not hitherto represented in the grounds, in places planned for them in the arboretum spaces, was carried on through both spring and autumn. The trees were mainly selected from the nurseries and borders, the best individuals of each kind being chosen. A list of the species set out, together with those native to the tract or long ago established, numbering 178 kinds, is appended. In placing the new trees, care has been taken to keep them at safe distances from the future driveways, as laid down in the General Plan.

Viticetum. A substantial rustic arbor, about 600 feet long, has been nearly completed for the climbers and twining plants along the edge of the forest, southeast of the Museum. The primary planting of this collection may be accomplished the coming spring. Trailers may be established along the rock-ledges near by.

Nurseries. In addition to the nursery grounds planted in 1896 and 1897, additional space of about one acre was prepared in the spring, near the southern corner of the tract, and partly occupied by shrubs and trees transplanted from the older nurseries, and partly by a very valuable collection of cuttings and seedlings from Siberia, received through the United States Department of Agriculture. The space set free in the older plantations was used for new material from various sources.

In the autumn nearly all the trees and shrubs set in the nurseries during 1896 and 1897, were transplanted to the Fruticetum, Arboretum and Borders, so that there is enough nursery ground already broken up for next spring's planting of seeds and seedlings.

Borders. The border screens have now been planted around the entire tract, except along the extreme southeastern side occupied by the nurseries and along the line where the Garden Reservation meets the other land of the park to the south. Considerable rearrangement of the older plantations along the railroad has been made by withdrawal and substitution; these borders will serve as reserve nurseries for many years.

Temporary Greenhouse. The use of the greenhouse on the Columbia University grounds at Morningside Heights, kindly granted by the President in 1896, has been continued, and has proved most important for preserving the valuable tender plants which have been donated by many friends, and for the growing of seeds from various sources. A list of species here stored is appended.

Record of Species under Cultivation. The Card Catalogue has been kept posted up as material has come to hand and a complete record of all plants grown is provided. In addition to this an herbarium specimen has been made of all plants which have flowered on the grounds and these have been brought together by families into a special herbarium, which is serving a valuable purpose in answering questions relative to species.

Buildings.

The contract of the Department of Parks with the John H. Parker Co., for the erection of the Museum Building, Power House, Stable and Closet group, is being rigidly carried out by Commissioner Moebus. A minor correction, relative to the size of the front brick, was found to be necessary, and a change has been made in the positions of some of the drain-pipes within the Museum; both of these modifications have received the approval of Mr. Gibson, architect. The work has been under the constant supervision of Mr. Brooks, an inspector of the Park Department, and has been repeatedly looked over by Mr. Daniel Ulrich, the Commissioner's Chief Engineer; in the progress of this work, and of other operations, Commissioner Moebus and Mr. Ulrich have made many valuable suggestions, and for these, as well as for their uniform courtesy, I desire to express my sincere gratitude.

Museum. Stakes marking the corners of the excavations for the Museum were set for the John H. Parker Co., contractors, on January 6th, and a construction shed for the excavators was built on January 21st. On January 22d, subcontractor Geo. Hudson began removing the top soil from the site, piling it, under our direction, at a point just to the east. The excavations were continued through the late winter and early spring, and the concrete footings for the walls and pillars were begun on May 24th. The first bricks were laid in the walls on May 31st. The construction work was then actively continued, the first iron pillars being set early in July. The building is now completely enclosed, except a portion of the dome, as shown by the accompanying photograph, and interior work is going on rapidly. It will probably be ready for occupancy by mid-summer.

Power House. The points marking the corners for the Power House excavation were staked on January 19th, and the work of excavation proceeded parallel with that for the Museum. The concrete footings for the walls were begun here on June 17th and were followed immediately by the

stonework of the walls themselves. The building was enclosed and its chimney completed in October. The setting of the boilers has just been completed, and little now remains to do to put the Power House into operation.

Steam Subway from Power House to Museum. The excavation of the trench to contain the subway carrying the steam pipes and electric wires from the Power House to the Museum was begun November 9th, and the greater part of the work has now been done, with the exception of the deep cutting, or possible tunnel, under the southern boulevard.

Stable. The corners of the stable were located by stakes on February 26th, and its masonry foundation walls were completed on June 18th. The superstructure was at once begun and the building completed and occupied by us, after consultation with the Commissioner of Parks, on November 14th, and under an appropriation made by the Board it has been equipped with four horses, suitable harness, two carts, a farm wagon, a truck, a spring wagon and a sled, and this equipment has enabled us to do very much more work than could previously be accomplished while we were under the necessity of hiring teams.

Public Comfort Station. This structure has been completed with the exception of its interior fittings.

Tool House. Taking advantage of the ruins of one of the outhouses of the old Lorillard estate, located on the grounds, east of the Bronx, which had three walls standing, a fourth wall was built for it, a roof put on and the building floored, during the summer, providing a useful hut for the storage of tools and other property.

The Range of Horticultural Houses. The contract for the erection of eight of the thirteen houses of this range was awarded by the Commissioner of Public Parks to Mr. John R. Sheehan, on March 31st. A construction shed was built by Mr. Sheehan at the site a few days afterward, but it was not possible to begin work on these structures at once. The contract was signed by the President of the Park Department late in November, and on January 3d the Hon. August Moebus, Com-

missioner of Parks, in the presence of a considerable number of people formally broke ground at the location of the central dome of the large palm house, and remarked as follows:

It is with great pleasure that I am present as the official representative of the great City of New York to take part in these exercises in breaking ground for the beautiful structure that in a few months will cover this ground, and be forever devoted to the Art and Science of Horticulture.

I congratulate the officers of the Botanical Society, that notwithstanding the various serious questions that have attended the administration of the new and greater New York, that but comparatively little delay has occurred to interfere with the progress of this work. And I can safely say that before the close of the coming year the beautiful Museum building as well as the Horticultural structure which we commence to-day will be completed and open for public use.

Under the provisions of the several acts of the legislature referring to the Botanical Garden, the present section of Bronx Park, comprising 250 acres, was set aside by the Park Department for the purposes of the Society. The City of New York through the Department of Parks was authorized to expend the sum of $500,000 for suitable structures; and finally by section 613 of the present charter, it is made the duty of the Commissioner of Parks for the Borough of the Bronx to maintain the New York Botanical Garden and the buildings appurtenant thereto.

It is, therefore, a duty as well as a pleasure that I should attend to-day, and briefly express my hearty coöperation in your work.

While much has been accomplished, much remains; in addition to the buildings before you and those to be erected, the important matter of laying out these grounds must soon be considered and provided for. I have already had several conferences with your energetic Director-in-Chief upon this subject and I trust that suitable appropriations will be made by the City authorities for the purpose.

In conclusion, permit me to say that in the present year, as in the year just closed, I will aid by every means in my power the speedy completion of this work to the end, that we may possess an institution, instructive, educational and ornamental, and a fitting illustration of the progress of the civilization of the present century.

The building has been staked out, and Mr. Sheehan proposes to begin excavations for his trenches within a few days.

Drainage.

After observation of the water-level in the Herbaceous Grounds area for a year, and a close survey of the surface, four systems of porous 4-inch drain-tile were laid in it during the early spring, outflowing into the central stream. This has produced an entirely satisfactory drainage of the land, except at one place near the southwestern end of the valley, where another small system of tile may be placed to advantage after the necessary excavations for the pool for aquatic monocotyledons have been effected.

A long system of six-inch and eight-inch porous tile was laid in the area about the stable-site near the eastern side of the grounds and south of the Bleecker street entrance, before the stable was built, and another long line of eight-inch tile was placed through the low grounds just north of the Bleecker street entrance. These, in connection with the filling and grading about the stable, have rapidly and satisfactorily carried off the water from these parts of the grounds. Both these systems require ultimate connection with the Bronx River; their outflow at present being turned into natural drainage valleys. The leaders from the roof of the stable find a convenient outflow into these pipes.

The natural drainage lines have been kept open, so that there is now but little possibility of water-stagnation, except at points in the north meadows, where extensive filling still needs to be done before the drain-pipes can well be laid, and at places along the river, where the contemplated modifications of the dam near the Lorillard mansion must be effected before entirely satisfactory conditions can be had.

The past season has been a good test of the sanitary condition of the tract. Large numbers of workmen have been employed on the buildings and grounds, but no sickness among them certainly traceable to the region itself has developed. During the summer there was some malarial trouble among the police force at the Lorillard mansion, to be credited, without doubt, to the well-water which had to be used before the city water-supply was brought to that building.

Grading.

In the spring a space of about 100 feet square on the east side of the Herbaceous Grounds was filled for an average thickness of one foot with top soil brought from the Museum excavations, to cancel an excess of moist land.

During the erection of the stable, a fill averaging about two and one-half feet deep was made all around that building, with soil supplied by Mr. J. B. McDonald, who laid a temporary track from his construction railroad and performed all the work in an expeditious manner. This area has been sown and planted.

The filling required about the power house, and for the service road for coal leading from behind that structure to its roof, derived from the excavations for the building itself, was made as nearly complete as the building operations would permit up to the beginning of cold weather. A few days' work in the spring will finish this work, so that the slopes may be sown and planted.

Late in October the large problem of constructing the desired slopes and terrace about the Museum was attacked, and work has been continued about the northwestern end of the building ever since, with all the force which could be spared from other necessary operations. Considerable progress has been made, but the greater part of this work still remains to be accomplished.

Several thousand cubic yards of rock and earth from the Museum excavations have been dumped by the contractors under my directions over an area of low ground south of the Museum, to help in the formation of the final surface, and in the building of the driveway located there, and a large amount from the same excavations has been hauled by them to the northwestern end of the lake-site north of the Museum, to make a necessary fill. This has all been carried out in accordance with the General Plan, which contemplates an equal amount of excavation and filling, with the shortest hauls possible.

Water Supply.

In April under the direction of the Commissioner of Parks, the 36-inch water main running through the grounds was tapped for a six-inch, at the point south of the Museum indicated on the general plan, and the pipe laid to the east end of the Museum, thus providing a water supply for that building, both for construction and operation.

In June, to facilitate the erection of the Power House, I obtained permission from the New York Central and Hudson River Railroad to lay a temporary one-inch pipe under the railroad bed from a pipe in the office of Church E. Gates, dealer in lumber, to the Power House site, and performed the work at the expense of the Garden.

The granting in the spring by the Park Department of the Lorillard Mansion to the Police Department for a station house, and its occupation by over 65 officers, rendered a wholesome water-supply for that building imperatively necessary, and in June Sergeant O'Brien, Architect of the Police Department, and Captain Fitzpatrick, in charge of the Station, made application to me, after a joint study by us of the available sources of supply, for permission to lay a pipe from a point on the thirty-six-inch main just north of the Southern Boulevard along the existing trails, past the northern end of the Herbaceous Grounds, to the Bronx River opposite the Mansion. With the approval of the President, and the Commissioner of Parks, I granted the desired permission. A three-inch pipe was laid from the thirty-six-inch main to the north end of the Herbaceous Grounds, where a two-inch branch was taken off to supply irrigation for those grounds when necessary in mid-summer, a very convenient and useful aid to our operations there, and a two-inch pipe continued to beyond the river outside the Garden reservation, where branches were laid to the Police Station, its stable and to one of the nurseries established by the Commissioner of Parks. The trench was located and excavated under my personal supervision and that of Mr. Henshaw; only one small and useless tree was taken down in the course of the work.

Care of the Grounds.

A few trees have died during the year and several have fallen; these, together with other unsightly ones, and several standing too close to the buildings, have been removed. There are now no dead trees standing, except seven in the Hemlock Forest; four of these were dead when the grounds were placed under our control; three have died during the past three years. It is a source of great satisfaction that the healthy condition of the forest is so well preserved.

The scattering of waste paper and other refuse brought in by visitors appears to be beyond our present control; it required the time of a man two days of each week during the summer to collect and dispose of this rubbish.

The hay of the tract was cut by George Hudson and others during July and August. About twelve tons were stacked for feed of our horses. An amount determined as the equivalent of $80.00 was exchanged for a horse, and the remainder sold for $80.00, which sum has been deposited with the Treasurer. The stack reserved was burned by mischievous boys early in November, a similar piece of mischief having been perpetrated last winter.

The planting of the Arboretum and Fruticetum spaces will make it necessary for the hay to be cut hereafter by our own men, to avoid injury to the shrubs and young trees.

No depredations worthy of special remark have been made on the plant collections. A very few plants have been stolen. The establishment of the 41st Precinct Police Station House at the Lorillard Mansion, and the constant passing of officers to and from it have doubtless prevented much damage. Captain Fitzpatrick and his men have been most watchful and attentive, and I take much pleasure in expressing my appreciation of their efforts. It will soon be necessary, however, to have officers detailed about the buildings and plantations.

Office.

Through the courtesy of Columbia University we were permitted to use rooms in the buildings at 49th Street and

Madison Avenue for office and storage purposes, until the old College site was sold, and this was a great favor. Upon the sale of this property, it was deemed expedient to establish the office at Bedford Park; a house on Suburban Street, near Perry Avenue, was rented, and the transferal of fixings and specimens made late in November by means of our own teams and laborers. A considerable amount of rough carpentering was necessary at the new rooms, and this was done by one of the laborers.

Lectures.

Public lectures in coöperation with the American Museum of Natural History were given in the lecture hall of that institution as follows:

Thursday Evening, March 24, 1898, "Hardy Flowering Shrubs and Perennials," by Mr. Cornelius Van Brunt.

Thursday Evening, March 31, 1898, "A Botanist's Rambles in the Mountains of Oregon," by Professor Francis E. Lloyd.

They were well attended and evidently much appreciated.

Library.

The accessions to the Library during the year are scheduled in an appendix to this report.

Part of the Library is shelved in the Bedford Park office; that portion of it which was stored last year in the Lorillard Mansion is boxed up. A number of additional exchanges for the BULLETIN have been arranged.

Museums and Herbarium.

The specimens obtained for the Museums and Herbarium are tabulated in an appendix to this report. Much work has been done on preparing them for exhibition, but much remains to be done. A report by Dr. Rusby, Honorary Curator of the Economic Collections, submitted to the Scientific Directors on December 19, 1898, accepted and ordered printed in the BULLETIN, outlines the important steps which

have been taken by him to secure exhibits, and for his energetic coöperation in this work I am very grateful.

It is hoped that by the time the Museum Building is ready for occupancy, that at least a temporary exhibit of much interest may be at once set up in several of the halls. About 22,000 specimens have been mounted for the Herbarium during the year, and arranged for reference at the Bedford Park office, the mounted herbarium now numbering over 30,000 specimens.

Insurance.

Fire Insurance Policies on property of the Garden are held as follows:

1. On museum and herbarium specimens in Terminal Storage Warehouse, $10,000.00.

2. On stable equipment, $1,000.00.

3. On Library, museum specimens, herbarium specimens and office furniture and fixings at Bedford Park office, $4,000.00.

Botanical Exploration of Porto Rico.

Through the kind liberality of Mr. Cornelius Vanderbilt, Mr. and Mrs. A. A. Heller have been sent to the island of Porto Rico to collect specimens illustrating the flora and natural vegetable resources of the new colony. Transportation to and from San Juan, and a letter to the General commanding the United States forces in Porto Rico, were obtained for the expedition from the War Department by Mr. Mills, and a complete outfit for collecting and for photography was provided. Mr. Heller has been instructed to keep careful field notes on all the plants collected, and it is expected that the work will yield results of much scientific and practical importance.

Botany of Montana.

The collections made in Montana during the summer of 1897 by Messrs. P. A. Rydberg and Ernst Bessey, by means of funds generously supplied by Mr. W. E. Dodge, have

now been studied, and these results, together with a study of all the previous collections made in that region, have been brought together by Mr. Rydberg in manuscript, as "An Annotated Catalogue of the Flora of Montana." Publication of this matter as the first volume of "Memoirs of the New York Botanical Garden" has been authorized by the Scientific Directors.

Work of the Park Department on the Roads.

The hauling of building materials over the existing roads has made it impossible to keep these in good order, although the Park Commissioner's men have done their best. The roads east of the Bronx have suffered less from this cause than those near the Museum. In order to facilitate watering the driveways, I made a water-connection, at the suggestion of Mr. Johnson, General Foreman, with a pipe near the Museum during the summer, and by means of a temporary overhead pipe enabled the water-cart men to conveniently and rapidly fill their casks.

During the fall the Commissioner has been able to have a large number of temporary park lights put up in all the parks of the Borough, and these are a great addition to the comfort of visitors and of the police.

Persons Employed and Their Work.

Mr. Samuel Henshaw, Head Gardener, has been in attendance throughout the year, except during a vacation of a month spent in Great Britain, during which he made a new study of British Botanical Gardens and of many of the principal commercial nurseries and private places. He secured seeds of many desirable plants, and at the same time arranged for the shipment of the yews and rhododendrons for Columbia University, subsequently planted under his direction about the Low Library. He has had general charge of all the planting, grading and drainage operations, and the care of the grounds, and his very practicable methods have done much toward enabling us to accomplish work economically.

Mr. George V. Nash, General Assistant, has had special charge of the herbaceous collection, its labeling and recording; he has also served as my secretary and clerk, and has accomplished much on the museum and herbarium collections, and in photography. His ready adaptability to all kinds of work have made him most efficient and useful.

Mr. Willard N. Clute has acted as Curator, being specially detailed on the mounting, collecting and distribution of herbarium specimens. He has also had charge of recording and labeling the woody plants in the nurseries and fruticetum.

Mr. W. R. Maxon has served as an assistant in herbarium and museum work since September 1st.

Dr. A. A. Tyler was employed through July and August, under the direction of Professor Rusby, in collecting and preserving specimens illustrating the economic botany of eastern North America, partly for exhibition in our own collections, but mainly for exchange purposes with other institutions.

Dr. P. A. Rydberg was employed during July, August and September in the determination and arrangement of the specimens collected by himself and others in Montana, and in preparing a report on them. He has since voluntarily continued this work during such time as his teaching duties at Upsala College have permitted.

Dr. John K. Small was employed for part of his time during July, August and September in selecting and arranging specimens to illustrate the local flora on the plan previously approved by the Scientific Directors, and in other work on museum and herbarium material.

Dr. Marshall A. Howe collected, determined and arranged Hepaticæ for the local flora exhibit during the parts of October and November.

Mr. W. A. Bastedo was employed during June and July in labeling and arranging specimens.

The number of laborers and gardeners employed has varied from six to fourteen.

N. L. Britton,
Secretary and Director-in-Chief.

Appendix I.

ACCESSIONS OF MATERIAL.

1. *Library.*

	Complete Volumes.	Parts and Pamphlets.
Purchased under the appropriation for library,..	211	26
Donated:		
L. Schoeney,.....	2	
The Duc de Loubat,.....	1	
Miss A. M. Vail,.....	3	17
Given by the Director-in-Chief, ...	10	85
By exchange for BULLETIN with other institutions, a list of which is given below, about,..	25	850
Total.....	252	978

LIST OF EXCHANGES.

Institutions.

Illinois State Laboratory of Natural History, Urbana, Ill.
N. Y. State Museum of Natural History, Albany, N. Y.
Eli Lilly & Co., Indianapolis, Ind.
American Museum of Natural History, New York City.
Smithsonian Institute, Washington, D. C.
U. S. Geological Survey, Washington, D. C.
Kew Gardens, London, England.
Botanical Department, Jamaica, West Indies.
Jardin Botanique, Geneva, Switzerland.
Botanical Garden, Trinidad, West Indies.
Missouri Botanic Garden, St. Louis, Mo.
University Library, Upsala, Sweden.
Denison University, Granville, Ohio.
Konigl. Bot. Museum, Berlin, Germany.
Field Columbian Museum, Jackson Park, Chicago, Ill.
Royal Botanic Garden, Sibpur, near Calcutta, India.
Agricultural Experiment Station, Auburn, Ala.
" " " Uniontown, Ala.
" " " Tucson, Ariz.
" " " Fayetteville, Ark.

Agricultural Experiment Station, Berkeley, Cal.
" " " Fort Collins, Colo.
" " " New Haven, Conn.
" " " Storrs, Conn.
" " " Newark, Del.
" " " Lake City, Fla.
" " " Experiment, Ga.
" " " Moscow, Idaho.
" " " Urbana, Ill.
" " " Lafayette, Ind.
" " " Ames, Iowa.
" " " Manhattan, Kans.
" " " Lexington, Ky.
" " " Audubon Park, New Orleans, La.
" " " Baton Rouge, La.
" " " Orono, Me.
" " " College Park, Md.
" " " Amherst, Mass.
" " " Agricultural College, Mich.
" " " St. Anthony Park, Minn.
" " " Agricultural College, Miss.
" " " Columbia, Mo.
" " " Lincoln, Neb.
" " " Reno, Nev.
" " " Durham, N. H.
" " " New Brunswick, N. J.
" " " Mesilla Park, N. Mex.
" " " Geneva, N. Y.
" " " Ithaca, N. Y.
" " " Raleigh, N. C.
" " " Fargo, N. D.
" " " Wooster, Ohio.
" " " Stillwater, Oklahoma.
" " " Corvallis, Oregon.
" " " State College, Pa.
" " " Kingston, R. I.
" " " Clemson College, S. C.
" " " Brookings, S. D.
" " " Knoxville, Tenn.

Agricultural Experiment Station, College Station, Texas.
" " " Logan, Utah.
" " " Burlington, Vt.
" " " Blacksburg, Va.
" " " Morgantown, W. Va.
" " " Madison, Wis.
" " " Laramie, Wyoming.
Brooklyn Institute of Arts and Sciences.
Botanic Garden, Cincinnati, Ohio.
New York Public Library.
Smith College, Northampton, Mass.
University of Wisconsin, Madison, Wis.
Victoria Gardens, Bombay, India.
U. S. Department of Agriculture, Washington, D. C.
Royal Botanic Garden, Glasnevin, Dublin, Ireland.
Columbia University Library.
Botanical Garden of the University of Siena, Italy.

Journals.

Beihefte Botanischen Centralblatt, Cassel, Germany.
Botanical Gazette, University of Chicago, Chicago, Ill.
American Monthly Microscopical Journal, Washington, D. C.
Vick's Monthly, Rochester, N. Y.
Pharmaceutical Record, New York City.
Meehan's Monthly, Germantown, Pa.
Revue Bryologique, Cahan, Athis, France.
Notarisia, Venice, Italy.
Nuovo Notarisia, Jardin Botanique, Padua, Italy.
Botaniska Notiser, Lund, Sweden.
Erythea, Berkeley, Cal.
American Gardening, New York City.
American Journal of Pharmacy, Philadelphia, Pa.
The Plant World, Washington, D. C.
Journal of Pharmacology, New York City.
Bulletin of Pharmacy, Detroit, Mich.
Pharmaceutical Review, Milwaukee, Wis.

Societies.

California Academy of Sciences, San Francisco, Cal.
Connecticut Academy of Arts and Sciences, New Haven, Conn.

Davenport Academy of Sciences, Davenport, Iowa.
Kansas Academy of Sciences, Topeka, Kan.
Appalachian Mountain Club, Boston, Mass.
Massachusetts Horticultural Society, Boston, Mass.
St. Louis Academy of Natural Sciences, St. Louis, Mo.
Elisha Mitchell Scientific Society, Chapel Hill, N. C.
Natural Science Association of Staten Island, New Brighton.
New York Microscopical Society, Flatbush, N. Y.
Cincinnati Society of Natural History, Cincinnati, Ohio.
Academy of Natural Sciences, Philadelphia, Pa.
Pennsylvania Forestry Association, Philadelphia, Pa.
Wisconsin Academy of Arts and Sciences, Madison, Wis.
Edinburgh Botanical Society, Edinburgh, Scotland.
Societe Botanique "Dodonea," University of Ghent, Belgium.
K. K. Zoöl. Bot. Gesellschaft, Vienna, Austria.
Societe Botanique, Luxemburg, Belgium.
Societe Botanique, Brussels, Belgium.
Botanischer Verein, Landshut, Baiern, Germany.
Sociedad Broteriana, Jardin Bot., Coimbra, Portugal.
Sociedad Cientifica Argentina, Buenos Ayres, La Plata, S. A.
Rochester Academy of Sciences, Rochester, N. Y.
Philadelphia Mycological Center, Philadelphia, Pa.
Naturforschende Gesellschaft, Zurich, Switzerland.
Buffalo Society of Natural Sciences, Buffalo, N. Y.

2. Museums and Herbarium.

	Specimens.
Dr. T. F. Allen, plants from Southern California, donated, ...	53
Dr. T. F. Lucy, Susquehanna Valley plants, donated,.....	86
T. H. Kearney, Jr., specimens from various localities, donated, ...	111
W. W. Ashe, North Carolina and Virginia plants, donated,	14
E. P. Bicknell, specimens from the vicinity of New York, donated, ...	13
Dr. E. H. Eames, Connecticut plants, donated,.....	36
U. S. National Museum, miscellaneous specimens, by exchange,.....	907
Professor E. O. Wooton, collection made in New Mexico, purchased, ...	990

A. A. Eaton, Massachusetts plants, donated,..... 4
S. B. Parish, Fourth Century California plants, purchased, 100
H. E. Brown, California plants, purchased,..... 239
C. V. Piper, Washington plants, donated,..... 7
T. H. Kearney, Jr., District of Columbia plants, donated, 243
O. A. Farwell, Michigan plants, donated,..... 2
A. S. Hitchcock, Kansas collection, purchased,..... 143
Maria S. Gibbes, Herbarium of the late Professor Lewis R. Gibbes, purchased,..... 1,500
H. H. Rusby, tubers of *Ipomoea pandurata*, donated,..... 3
J. W. Toumey, Arizona plants, donated,..... 8
Aven Nelson, Wyoming Sedges, donated,..... 14
C. K. Dodge, Michigan plants, donated,..... 5
F. C. Nicholas, collection from United States of Colombia, donated,..... 42
Frank F. Fenno, grasses from Southern New York, dodated, ... 15
W. C. Osborn, fasciated *Hesperis matronalis*, donated, 4
J. K. Small, miscellaneous specimens, donated,..... 30
C. L. Pollard, South Florida collection, purchased,..... 200
C. D. Fretz, specimens from Southern New Jersey, donated, ... 2
U. S. National Museum, miscellaneous specimens by exchange, ... 435
Reginald S. Cocks, *Daubentonia longifolia*, donated,..... 1
Professor F. Kurtz, collection from the Argentine Republic, by exchange,..... 300
John Currie, *Calluna vulgaris*, Halifax, N. S., donated, 1
S. B. Richard, Rubber Gum and foliage of tree producing it (*Micrandra*) from the Orinoco,..... 5
H. Hapeman, Nebraska specimens, donated,..... .. 2
J. K. Small, collection from the Southern States, purchased, ... 582
Edward Reagan, golden rods from Morris Plains, N. J., donated, ... 5
James W. Withers, large acorns of the red oak, donated, 1
T. J. W. Burgess, *Iris lacustris*, donated,..... 2
Royal Botanic Gardens, Kew, specimens from various localities, by exchange,..... 548
Museum of Natural History, Paris (through Miss A. M. Vail), by exchange,..... 2,644

L. Barron, photograph of *Lilium longiflorum*, donated,... 1
J. W. Ellis, photograph of *Anthurium Veitchii*, donated, 1
DeAlton Saunders, South Dakota plants, donated,..... 18
W. A. Kellerman, three species of *Helianthus* from Ohio, donated, ... 6
Morris Coster, plate of *Carica Papaya*, donated,..... 1
A. A. Eaton, *Lophotocarpus* from Newberry, Mass., donated, ... 1
O. A. Farwell, Michigan plants, donated,..... 15
Professor Francis E. Lloyd, Herbarium, mainly consisting of plants of the Northwest, donated, about..... 6,000
Jos. Crawford, miscellaneous specimens, donated,..... 102
A. E. Keun & Co. (through Edward Kemp), exhibit illustrating Opium industry at Smyrna, donated,..... 15
Biltmore Herbarium, plants from North Carolina, by exchange,..... 393
W. A. Kellerman, *Veronica Teucrium*, from Ohio, donated, ... 1
Miss Anna M. Vail, miscellaneous specimens, donated,... 26
Collected by Willard N. Clute, Assistant, to illustrate the local flora and for purposes of exchange,..... 2,205
Collected by the Director-in-Chief, at various localities,... 820
Collected by Geo. V. Nash and Willard N. Clute, Assistants, for special herbarium, to record plants under cultivation, about,..... 1,600
Miscellaneous specimens collected by Geo. V. Nash, Assistant, at various localities,..... 400
F. L. Atkins, collection of floral photographs, purchased, 450
A. A. Tyler, collection of specimens to illustrate the economic botany of the eastern U. S., under a commission from the Director-in-Chief, about,..... 3,300
B. F. Bush, Missouri collection, purchased,..... 429
P. A. Rydberg, specimens from the Rocky Mountains, purchased, ... 336
Frank H. Lamb, plants of western Washington, purchased, 300
Field Columbian Museum, Yucatan collection, by exchange, ... 376
A. D. E. Elmer, Washington collection, purchased, ... 500
B. F. Bush, collections from the Indian Territory and Missouri, purchased, ... 358

Alabama Biological Survey, collection illustrating flora of the State, purchased,.....	1,258
B. F. Bush, southern swamp plants, purchased,.....	300
A. Fredholm, Jamaica collection, purchased,.....	300
S. M. Tracy, Mississippi plants, purchased,.....	300
H. E. Brown, second California collection, purchased,...	235
A. A. Heller, collections from Washington, Texas and Arizona, purchased,.....	890
	29,234

3. Plants for the Grounds and Greenhouses.

	Specimens.
Parke, Davis & Co., *Agaves*, donated,.....	2
E. S. Miller, herbaceous perennials, donated,.....	156
Buffalo Botanic Garden, herbaceous perennials and willow cuttings, by exchange,.....	100
F. Harrington, herbaceous perennials, donated,.....	2
S. W Harriot, variegated fern, donated,.....	5
S. Henshaw, evergreens, donated,.....	12
U. S. Department of Agriculture, Division of Plant Introduction Experiment, Siberian shrubs, by exchange,.....	280
Thos. Meehan & Sons, conifers, purchased.....	50
Dr. G. N. Best, *Pinus pungens*, purchased,.....	13
E. S. Miller, shrubs and herbaceous perennials, donated,	75
Miss Delia W. Marble, violets, donated,.....	4
John Crosby Brown, large tree-fern, donated,.....	1
Mrs. T. Y. Grimke, Spanish Bayonet, donated,.....	4
W. R. Maxon, Hartstongue Ferns, donated,..	15
C. L. Gruber, white-fruited strawberry, donated,.....	3
Miss L. Murray Ledyard, Hartstongue Fern from Perryville Falls, N. Y.,.....	1
T. S. Constantine, Jr., herbaceous perennials, donated,...	4
A. A. Eaton, herbaceous perennials from N. H., donated,	20
John Crosby Brown, a large palm (*Latania*), donated,..	1
John W. Ellis, large *Anthuriums*, donated,.....	2
Wm. Runkle, *Cycas circinalis*, donated,.....	1
E. S. Miller, greenhouse plants, donated,.....	137
W. R. Maxon, ferns from central N. Y., donated,.....	16
H. H. Rusby, *Apocynums*, donated,.....	3
B. L. Robinson, herbaceous perennials, donated,.....	4
W. J. Beal, herbaceous perennials, by exchange,.....	8

N. Jonson Rose, shrubs and trees, by exchange,.....	12
Peter Barr & Son, collection of daffodils and pæonies, donated, ...	717
Collected by the Director-in-Chief,.....	52
Collected by Geo. V. Nash, Assistant,.....	54
Collected and obtained by Samuel Henshaw, Head Gardener, ...	130
Collected by Willard N. Clute, Assistant,.....	40
Jos. Crawford, herbaceous perennials, donated,.....	6
Miss Anna M. Vail, herbaceous perennials, donated,.....	4
Michigan Wild Flower Co., shrubs and herbaceous perennials, purchased,.....	72
H. A. Dreer, aquatics, purchased,.....	60
Evergreen Nurseries, seedlings, purchased, ...	240
Wm. Elliott & Sons, bulbs, purchased,.....	300
Raised from seed and otherwise propagated, about,.....	9,000
	11,606

Seeds.

	Packets.
Dr. T. E. Wilcox, Cucurbitaceæ from Arizona, donated,	2
D. M. Andrews, Colorado plants, purchased,.....	150
Edinburgh Botanical Garden, by exchange,.....	964
Botanical Garden of Geneva, by exchange,.....	2,064
Susan Tucker, Washington plants, purchased,.....	21
Botanical Garden, University of California, by exchange,	106
P. A. Rydberg, Rocky Mountain plants, donated,.....	22
U. S. Department of Agriculture, Division of Plant Introduction Experiments, by exchange,.....	10
Mrs. C. A. Wood, *Adlumia fungosa*, donated, ...	1
Botanical Garden of Calcutta, *Ficus altissima*, by exchange,.....	1
W. J. Beal, Botanical Garden of the Michigan Agricultural College, by exchange,.....	40
Elmer Sterns, Sago Lily, donated,.....	1
Prof. C. L. Bristol, Dutchman's Pipe from Bermuda, donated, ...	1
Miss A. M. Vail, *Lespedeza trigonoclada*, donated,.....	1
Seeds collected by the staff, about.....	400
	3,778

Appendix 2.

SCHEDULE OF EXPENDITURES DURING 1898 UNDER APPROPRIATIONS MADE BY THE BOARD.

Salaries.

Appropriated,	$9,360.00
Expended,	9,347.47
Balance,	$12.53

Appropriation for engineering.

Appropriated,	$300.00
Expended,	290.50
Balance,	$9.50

Appropriation for Labor and Teams.

Appropriated,	$5,020.00
Expended,	5,004.16
Balance,	$15.84

Appropriation for Drainage.

Appropriated,	$500.00
Expended,	486.11
Balance,	$13.89

Appropriation for Purchase of Plants.

Appropriated,	$300.00
Expended,	291.70
Balance,	$8.30

Appropriation for Operating Temporary Greenhouse.

Appropriated,	$300.00
Expended,	247.94
Balance,	$52.06

Appropriation for Circulars and Notices to Annual Members.

Appropriated,	$300.00
Expended,	299.45
Balance,	.55

Appropriation for Supplies and Tools.

Appropriated,	$675.00
Expended,	665.17
Balance,	$9.83

APPROPRIATION FOR SCIENTIFIC DIRECTORS, FOR MUSEUM AND HERBARIUM MATERIAL.

Appropriated,	$1,500.00
Expended,	1,497.27
Balance,	$2.73

APPROPRIATION FOR SCIENTIFIC DIRECTORS, FOR LECTURES.

Appropriated,	$200.00
Expended,	196.85
Balance,	$3.15

APPROPRIATION FOR SCIENTIFIC DIRECTORS, FOR BULLETIN.

Appropriated,	$500.00
Expended,	490.60
Balance,	$9.40

APPROPRIATION FOR SCIENTIFIC DIRECTORS, FOR LIBRARY.

Appropriated,	$380.00
Expended,	353.17
Balance,	$26.83

APPROPRIATION FOR SCIENTIFIC DIRECTORS, FOR CONTINGENT FUND.

Appropriated,	$360.00
Expended,	358.49
Balance,	$1.51

APPROPRIATION FOR SURVEYING OUTFIT.

Appropriated,	$400.00
Expended,	389.95
Balance,	$10.05

APPROPRIATION FOR TYPEWRITER.

Appropriated,	$100.00
Expended,	100.00

APPROPRIATION FOR SAFE.

Appropriated,	$100.00
Transferred,	100.00

APPROPRIATION FOR MOWING-MACHINE.

Appropriated,	$40.00
Expended,	40.00

APPROPRIATION FOR EQUIPMENT OF STABLE.

Appropriated,	$700.00
Expended,	664.85
Balance,	$35.15

Appendix 3.—Lists of Plants in the Grounds, 1898.

A. WILD FLORA.

Subkingdom 3.—BRYOPHYTA.*

Class 1. HEPATICAE.—Liverworts.†

Riccia fluitans Sullivantii.
Bazzania trilobata.
Cephalozia catenulata.
connivens.
media.
Frullania Eboracensis.
Lejeunea echinata.
Odontoschisma sphagni.

Class 2. ANTHOCEROTES.

Anthoceros laevis.
Notothylas orbicularis.

Class 3. MUSCI.—Mosses.‡

Polytrichum commune.
Ohioense.
piliferum.
Pogonatum tenue.
Catharinea angustata.
Buxbaumia aphylla.
Webera sessilis.
Fissidens taxifolius.
Ceratodon purpureus.
Ditrichum tortile.
Dicranella heteromalla.
Dicranum scoparium.
Leucobryum glaucum.
Orthotrichum Ohioense.
Weissia Americana.
Ptychomitrium incurvum.
Hedwigia albicans.
Funaria hygrometrica.
Physcomitrium turbinatum.
Barbula unguiculata.
Bryum argenteum.
caespiticium.
Leptobryum pyriforme.
Mnium cuspidatum.
punctatum.
Anomodon attenuatus.
Leskea obscura.
Thuidium paludosum.
Climacium Americanum.
Cirriphyllum Boscii.
Brachythecium oxycladon dentatum.
plumosum.
Plagiothecium denticulatum.
elegans.
Raphidostegium microcarpum.
Hypnum Haldanianum.
cupressiforme.
molluscum.

Subkingdom 4.—PTERIDOPHYTA.

Ophioglossaceae.—Adders-tongue Family.

Botrychium dissectum.

Osmundaceae.—Royal Fern Family.

Osmunda cinnamomea.
regalis.

Polypodiaceae.—Fern Family.

Asplenium Filix-foemina.
platyneuron.
Cystopteris fragilis.
Dicksonia punctilobula.
Dryopteris acrostichoides.

* The Mycetozoa and the Thallophyta (Algae, Fungi and Lichens) of the tract have been considerably collected and studied, but their enumeration is deferred until the lists are more complete. The list of Bryophyta will be enlarged by subsequent study.

† Collected and determined by Marshall A. Howe.

‡ Collected and determined by Elizabeth G. Britton.

Dryopteris marginalis.
Noveboracensis.
spinulosa intermedia.
Thelypteris.
Onoclea sensibilis.
Phegopteris hexagonoptera.
Phegopteris.
Polypodium vulgare.

EQUISETACEAE.—Horsetail Family.
Equisetum arvense.
fluviatile.
hyemale.

SELAGINELLACEAE.—Selaginella Family.
Selaginella apus.
rupestris.

Subkingdom 5.—SPERMATOPHYTA.*

Class 1. GYMNOSPERMAE.

PINACEAE.—Pine Family.
Juniperus Virginiana.
Larix laricina.
Pinus Strobus.
Tsuga Canadensis.
Picea excelsa.

Class 2. ANGIOSPERMAE.

Subclass 1. MONOCOTYLEDONES.

TYPHACEAE.—Cat-tail Family.
Typha latifolia.

SPARGANIACEAE.—Bur-reed Family.
Sparganium eurycarpum.

ALISMACEAE.—Water Plantain Family.
Alisma Plantago-aquatica.
Sagittaria latifolia.

GRAMINEAE.—Grass Family.
Agropyron repens.
Agrostis alba.
vulgaris.
intermedia.
perennans.
Andropogon scoparius.
Virginicus.
Anthoxanthum odoratum.
Aristida dichotoma.
gracilis.
Avena sativa.
Bromus racemosus.
Calamagrostis Canadensis.
Cenchrus tribuloides.
Chaetochloa glauca.
viridis.
Cinna arundinacea.
Dactylis glomerata.
Danthonia compressa.
spicata.
Eatonia nitida.
Pennsylvanica.
Elymus Canadensis.
Eragrostis capillaris.
hypnoides.
pectinacea.
Purshii.
Festuca elatior.
octoflora.
Holcus lanatus.
Homalocenchrus oryzoides.
Virginicus.
Hystrix Hystrix.
Lolium Italicum.
perenne.
Muhlenbergia diffusa.
Mexicana.
sobolifera.
Panicularia acutiflora.
brachyphylla.
Canadensis.
fluitans.
nervata.
pallida.
Panicum agrostoides.
Atlanticum.
barbulatum.
Bicknellii.
capillare.
Gattingeri.
clandestinum.
commutatum.

*Native plants in roman; naturalized and adventive plants in *italic.*

Panicum commutatum minor.
Crus-galli.
depauperatum.
dichotomum.
elongatum.
Enslini.
macrocarpon.
miliaceum.
minus.
Porterianum.
proliferum.
pubescens.
sphaerocarpon.
tsugetorum.
Walteri.
Paspalum pubescens.
setaceum.
Phalaris arundinacea.
Phleum pratense.
Poa annua.
compressa.
flava.
pratensis.
Sporobolus vaginaeflorus.
Syntherisma filiformis.
linearis.
sanguinalis.
Tricuspis seslerioides.

CYPERACEAE.—Sedge Family.

Carex Asa-Grayi.
cephalophora.
costellata.
crinita.
cristatella.
digitalis.
flexilis.
gracillima.
grisea.
hystricina.
lanuginosa.
laxiculmis.
laxiflora.
blanda.
patulifolia.
lupulina.
lurida.
Muhlenbergii.
pallescens.
Carex pedicellata.
Pennsylvanica.
pubescens.
rosea.
scoparia.
sparganioides.
squarrosa.
sterilis.
stipata.
stricta.
tentaculata.
triceps.
typhinoides.
varia.
virescens.
vulpinoidea.
xanthocarpa.
Cyperus diandrus.
esculentus.
filiculmis.
strigosus.
Eleocharis ovata.
tenuis.
Scirpus atrovirens.
lacustris.
planifolius.

ARACEAE.—Arum Family.

Acorus Calamus.
Arisaema triphyllum.
Peltandra Virginica.
Spathyema foetida.

LEMNACEAE.—Duckweed Family.

Lemna minor.

PONTEDERIACEAE.—Pickerel-weed Family.

Pontederia cordata.

JUNCACEAE.—Rush Family.

Juncoides campestre.
Juncus effusus.
tenuis.

MELANTHACEAE.—Bunch-flower Family.

Uvularia sessilifolia.
Veratrum viride.

LILIACEAE.—Lily Family.

Allium vineale.
Erythronium Americanum.

Hemerocallis fulva.
Lilium Canadense.
superbum.
Ornithogalum umbellatum.

CONVALLARIACEAE.—Lily-of-the-Valley Family.

Asparagus officinalis.
Medeola Virginiana.
Polygonatum biflorum.
commutatum.
Trillium cernuum.
Unifolium Canadense.
Vagnera racemosa.

SMILACEAE.—Smilax Family.

Smilax herbacea.
rotundifolia.

AMARYLLIDACEAE.—Amaryllis Family.

Hypoxis hirsuta.

DIOSCOREACEAE.—Yam Family.

Dioscorea villosa.

IRIDACEAE.—Iris Family.

Iris versicolor.
Sisyrinchium angustifolium.
graminoides.

ORCHIDACEAE.—Orchid Family.

Gyrostachys cernua.
gracilis.
Habenaria lacera.

Subclass 2. DICOTYLEDONES.

SAURURACEAE.—Lizard's-tail Family.

Saururus cernuus.

JUGLANDACEAE.—Walnut Family.

Hicoria alba.
microcarpa.
minima.
ovata.
Juglans cinerea.
nigra.

MYRICACEAE.—Bayberry Family.

Comptonia peregrina.
Myrica Carolinensis.

SALICACEAE.—Willow Family.

Populus alba.
grandidentata.
Populus tremuloides.
Salix alba vitellina.
discolor.
nigra.
petiolaris.
sericea.

BETULACEAE.—Birch Family.

Alnus rugosa.
Betula lenta.
populifolia.
Carpinus Caroliniana.
Corylus Americana.

FAGACEAE.—Beech Family.

Castanea dentata.
Fagus Americana.
Quercus alba.
coccinea.
palustris.
platanoides.
rubra.
velutina.

ULMACEAE.—Elm Family.

Celtis occidentalis.
Ulmus Americana.

MORACEAE.—Mulberry Family.

Morus rubra.

URTICACEAE.—Nettle Family.

Boehmeria cylindrica.
Urticastrum divaricatum.

SANTALACEAE.—Sandalwood Family.

Comandra umbellata.

ARISTOLOCHIACEAE.—Birthwort Family.

Asarum reflexum.

POLYGONACEAE.—Buckwheat Family.

Polygonum arifolium.
aviculare.
Convolvulus.
Persicaria.
sagittatum.
Virginianum.
Rumex Acetosella.
crispus.
obtusifolius.

CHENOPODIACEAE.—Goosefoot Family.

Chenopodium album.
ambrosioides.

PHYTOLACCACEAE.—Pokeweed Family.

Phytolacca decandra.

AIZOACEAE.—Carpet-weed Family.

Mollugo verticillata.

PORTULACACEAE.—Purslane Family.

Portulaca oleracea.

CARYOPHYLLACEAE.—Pink Family.

Alsine graminea.
longifolia.
media.
Anychia Canadensis.
Arenaria serpyllifolia.
Saponaria officinalis.
Scleranthus annuus.
Silene Caroliniana.
stellata.

NYMPHAEACEAE.—Water-lily Family.

Castalia odorata.
Nymphaea Kalmiana.

MAGNOLIACEAE.—Magnolia Family.

Liriodendron Tulipifera.

RANUNCULACEAE.—Crowfoot Family.

Anemone quinquefolia.
Virginiana.
Aquilegia Canadensis.
Clematis Virginiana.
Hepatica Hepatica.
Ranunculus abortivus.
acris.
bulbosus.
hispidus.
obtusiusculus.
recurvatus.
septentrionalis.
Syndesmon thalictroides.
Thalictrum polygamum.

LAURACEAE.—Laurel Family.

Benzoin Benzoin.
Sassafras Sassafras.

FUMARIACEAE.—Bleeding-heart Family.

Bicuculla Cucullaria.
Capnoides sempervirens.

CRUCIFERAE.—Mustard Family.

Arabis Canadensis.
Barbarea Barbarea.
praecox.
stricta.
Bursa Bursa-pastoris.
Cardamine bulbosa.
Pennsylvanica.
Dentaria laciniata.
Draba verna.
Lepidium Virginicum.
Roripa palustris.

CRASSULACEAE.—Orpine Family.

Penthorum sedoides.

SAXIFRAGACEAE.—Saxifrage Family.

Heuchera Americana.
Saxifraga Virginiensis.

HAMAMELIDACEAE.—Witch-Hazel Family.

Hamamelis Virginiana.
Liquidambar Styraciflua.

PLATANACEAE.—Plane-tree Family.

Platanus occidentalis.

ROSACEAE.—Rose Family.

Agrimonia hirsuta.
mollis.
Fragaria Virginiana.
Geum Canadense.
Virginianum.
Potentilla argentea.
pumila.
simplex.
Rosa Carolina.
humilis.
Rubus Canadensis.
occidentalis.
setosus.
villosus.

POMACEAE.—Apple Family.
Crataegus Oxyacantha.
Malus Malus.
Pyrus communis.

DRUPACEAE.—Plum Family.
Prunus Avium.
serotina.

CAESALPINACEAE.—Senna Family.
Cassia nictitans.
Gleditsia triacanthos.

PAPILIONACEAE.—Pea Family.
Apios Apios.
Crotalaria sagittalis.
Falcata comosa.
Lathyrus palustris.
Lespedeza frutescens.
procumbens.
Medicago lupulina.
Meibomia Canadensis.
Dillenii.
nudiflora.
paniculata.
Melilotus alba.
officinalis.
Robinia Pseudacacia.
Trifolium agrarium.
hybridum.
pratense.
repens.
Vicia tetrasperma.

GERANIACEAE.—Geranium Family.
Geranium maculatum.

OXALIDACEAE.—Wood-sorrel Family.
Oxalis cymosa.

LINACEAE.—Flax Family.
Linum Virginianum.

SIMARUBACEAE.—Ailanthus Family.
Ailanthus glandulosa.

POLYGALACEAE.—Milkwort Family.
Polygala verticillata.

EUPHORBIACEAE.—Spurge Family.
Acalypha Virginica.
Euphorbia maculata.

ANACARDIACEAE.—Sumac Family.
Rhus glabra.
radicans.

ILICACEAE.—Holly Family.
Ilex verticillata.

CELASTRACEAE.—Staff-tree Family.
Celastrus scandens.
Euonymus Americanus.

STAPHYLEACEAE.—Bladder-nut Family.
Staphylea trifolia.

ACERACEAE.—Maple Family.
Acer rubrum.
saccharinum.
Saccharum.

BALSAMINACEAE.—Jewel-weed Family.
Impatiens biflora.

RHAMNACEAE.—Buckthorn Family.
Ceanothus Americana.
Rhamnus cathartica.

VITACEAE.—Grape Family.
Parthenocissus quinquefolia.
Vitis aestivalis.

MALVACEAE.—Mallow Family.
Hibiscus Syriacus.
Malva rotundifolia.

HYPERICACEAE.—St. John's-wort Family.
Hypericum mutilum.
perforatum.
Sarothra gentianoides.

CISTACEAE.—Rock-rose Family.
Helianthemum Canadense.
Lechea intermedia.
Leggettii.

VIOLACEAE.—Violet Family.
Viola blanda.
amoena.
cucullata.
Labradorica.
obliqua.
ovata.
palmata.
dilatata.

Viola pedata.
rotundifolia.
scabriuscula.
sororia.

CACTACEAE.—Cactus Family.
Opuntia Opuntia.

ONAGRACEAE.—Evening Primrose Family.
Circaea Lutetiana.
Epilobium coloratum.
Kneiffia fruticosa.
Pilosella.
pumila.
Onagra biennis.

ARALIACEAE.—Ginseng Family.
Aralia nudicaulis.
racemosa.
Panax trifolia.

UMBELLIFERAE.—Carrot Family.
Cicuta maculata.
Daucus Carota.
Deringa Canadensis.
Hydrocotyle Americana.
Pastinaca sativa.
Sanicula Canadensis.
gregaria.
Washingtonia Claytoni.

CORNACEAE.—Dogwood Family.
Cornus alternifolia.
Amomum.
candidissima.
florida.
Nyssa sylvatica.

CLETHRACEAE.—White-Alder Family.
Clethra alnifolia.

PYROLACEAE.—Wintergreen Family.
Chimaphila maculata.
Pyrola elliptica.

MONOTROPACEAE.—Indian Pipe Family.
Monotropa uniflora.

ERICACEAE.—Heath Family.
Azalea nudiflora.
Epigaea repens.
Gaultheria procumbens.
Kalmia latifolia.

VACCINIACEAE.—Huckleberry Family.
Vaccinium corymbosum.
vacillans.

PRIMULACEAE.—Primrose Family.
Lysimachia Nummularia.
quadrifolia.
terrestris.
Steironema ciliatum.

OLEACEAE.—Olive Family.
Fraxinus Americana.
Pennsylvanica.
Syringa vulgaris.

GENTIANACEAE.—Gentian Family.
Gentiana Andrewsii.

APOCYNACEAE.—Dogbane Family.
Apocynum canabinum.
Vinca minor.

ASCLEPIADACEAE.—Milkweed Family.
Asclepias decumbens.
exaltata.
pulchra.
Syriaca.

CONVOLVULACEAE.—Morning-Glory Family.
Convolvulus Sepium.

CUSCUTACEAE.—Dodder Family
Cuscuta Gronovii.

BORAGINACEAE.—Borage Family.
Myosotis laxa.

VERBENACEAE.—Vervain Family.
Verbena urticifolia.

LABIATAE.—Mint Family.
Glechoma hederacea.
Hedeoma pulegioides.
Koellia mutica.
Leonurus Cardiaca.
Lycopus rubellus.
Virginicus.
Nepeta Cataria.
Origanum vulgare.
Prunella vulgaris.

Scutellaria lateriflora.
Trichostema dichotomum.

SOLANACEAE.—Potato Family.
Physalis heterophylla.
Solanum Dulcamara.

SCROPHULARIACEAE.—Figwort Family.
Gerardia tenuifolia.
Gratiola Virginiana.
Linaria Canadensis.
Linaria.
Melampyrum lineare.
Mimulus ringens.
Pedicularia Canadensis.
lanceolata.
Scrophularia leporella.
Marylandica.
Veronica Chamaedrys.
officinalis.
peregrina.
serpyllifolia.

OROBANCHACEAE.—Broom-rape Family.
Leptamnium Virginianum.
Thalesia uniflora.

BIGNONIACEAE.—Trumpet-Creeper Family.
Tecoma radicans.

PHRYMACEAE.—Lopseed Family.
Phryma Leptostachya.

PLANTAGINACEAE.—Plantain Family.
Plantago lanceolata.
Rugelii.

RUBIACEAE.—Madder Family.
Cephalanthus occidentalis.
Galium *Aparine.*
circaezans.
Mollugo.
tinctorium.
triflorum.
Mitchella repens.

CAPRIFOLIACEAE.—Honeysuckle Family.
Sambucus Canadensis.
Viburnum acerifolium.
Viburnum dentatum.
Lentago.
prunifolium.

CUCURBITACEAE.—Gourd Family.
Sicyos angulatus.

CAMPANULACEAE.—Bell-flower Family.
Campanula aparinoides.
Specularia perfoliata.
Lobelia inflata.
syphilitica.

CICHORIACEAE.—Chicory Family.
Adopogon Caroliniarum.
Cichorium Intybus.
Hieracium Gronovii.
paniculatum.
venosum.
Lactuca Canadensis.
Leontodon autumnale.
Nabalus trifoliolatus.
Taraxacum erythrospermum.
Taraxacum.

AMBROSIACEAE.—Ragweed Family.
Ambrosia artemisiaefolia.
trifida.

COMPOSITAE.—Thistle Family.
Achillea Millefolium.
Antennaria neglecta.
plantaginifolia.
Arctium minus.
Aster cordifolius.
polycephalus.
divaricatus.
ericoides.
lateriflorus.
Lowrieanus.
macrophyllus.
multiflorus.
Novae-Angliae.
puniceus.
Tradescanti.
undulatus.
vimineus.
Bidens bipinnata.
connata.
frondosa.
helianthoides.

Carduus *arvensis*.
discolor.
muticus.
Chrysanthemum Leucanthemum.
Parthenium.
Erechtites hieracifolia.
Erigeron annuus.
pulchellus.
ramosus.
Eupatorium ageratoides.
maculatum.
perfoliatum.
purpureum.
Euthamia graminifolia.
Helianthus giganteus.
Helianthus strumosus.
Leptilon Canadense.
Rudbeckia *hirta*.
laciniata.
Senecio aureus.
Solidago bicolor.
caesia.
Canadensis.
juncea.
nemoralis.
patula.
rugosa.
serotina.
Vernonia Noveboracensis.
Willughbaea scandens.

B. HERBACEOUS COLLECTION.

PTERIDOPHYTA.

OPHIOGLOSSACEAE.

Botrychium dissectum.
lanceolatum.
obliquum.
simplex.
Virginianum.
Ophioglossum arenarium.
vulgatum.

OSMUNDACEAE.

Osmunda cinnamomea.
Claytoniana.
regalis.

POLYPODIACEAE.

Adiantum pedatum.
Asplenium acrostichoides.
Filix-foemina.
platyneuron.
septentrionalis.
Trichomanes.
Athyrium Gouringianum pictum.
Camptosorus rhizophyllus.
Cheilanthes Feudleri.
lanuginosa.
Cryptogramme acrostichoides.
Cystopteris bulbifera.
fragilis.
Dryopteris acrostichoides.
Boottii.
Braunii.
cristata × marginalis.
Filix-mas.
Goldieana.
marginalis.
simulata.
spinulosa.
Thelypteris.
Noveboracensis.
Notholaena Feudleri.
Onoclea sensibilis.
Struthiopteris.
Pellaea atropurpurea.
Phegopteris Dryopteris.
hexagonoptera.
Phegopteris.
Phyllitis Scolopendrium.
Polypodium vulgare.
Pteris aquilina.
Woodsia Ilvensis.

Woodsia obtusa.
Woodwardia areolata.

EQUISETACEAE.

Equisetum arvense.
fluviatile.
hyemale.

LYCOPODIACEAE.

Lycopodium lucidulum.

SELAGINELLACEAE.

Selaginella apus.
rupestris.

SPERMATOPHYTA.

Monocotyledones.

GRAMINEAE.

Agropyron dasystachyum.
glaucum.
intermedium.
Japonicum.
repens.
spicatum.
tenerum.
Agrostis alba.
intermedia.
pallida.
perennans.
Ammophila Baltica.
Andropogon brevifolius.
Ischaemum.
Virginicus.
Anthoxanthum odoratum.
Arrhenatherum elatius.
Arundinella anomala.
Arundo Donax.
variegata.
Avena alba.
fatua.
minor.
planiculmis.
pubescens.
strigosa.
Bouteloua curtipendula.
oligostachya.
Brachypodium distachyum.
pinnatum rupestre.
Briza compacta.
Bromus albidus.
breviaristatus.
Canadensis.
erectus.
inermis.
Bromus maximus.
mollis.
scoparius.
sterilis.
Tacna.
tectorum.
Bulbilis dactyloides.
Calamagrostis Canadensis.
Calamovilfa longifolia.
Chaetochloa glauca.
Italica.
viridis.
Coix Lachryma-Jobi.
Corynephorus canescens.
Cynosurus cristatus.
elegans.
Dactylis glomerata.
Danthonia spicata.
Deschampsia atropurpurea.
caespitosa.
pulchella.
Dimeria ornithopoda.
Elymus Americanus.
arenarius.
Canadensis.
glaucus.
Virginicus.
Eragrostis pectinacea.
Erianthus contortus. ?
Festuca ampla.
arundinacea.
bromoides.
capillata.
duriuscula.
crassifolia.
elatior.
heterophylla.

Festuca nigrescens.
ovina duriuscula trachyphylla.
sulcata.
Holcus argenteus.
lanatus.
Hordeum coeleste.
Hystrix.
macrolepis.
Manchurianum.
vulgare.
Hystrix Hystrix.
Lolium Italicum.
perenne.
Lygeum Spartum.
Melica Bauhinii.
Miscanthus Sinensis gracillimus.
variegatus.
zebrinus.
Muhlenbergia sobolifera.
tenuiflora.
Panicularia acutiflora.
brachyphylla.
fluitans.
nervata.
pallida.
Panicum agrostoides.
Atlanticum.
barbulatum.
Bicknellii. ?
capillare.
claudestinum.
commutatum.
Crus-galli.
depauperatum.
dichotomum.
elongatum.
Enslini.
laxiflorum.
macrocarpon.
miliaceum.
minus.
polyanthes.
Porterianum.
pubescens.
Scribnerianum.
sphaerocarpon.
sphagnicolum ?
tsugetorum.
Panicum virgatum.
Paspalum pubescens.
Phalaris arundinacea.
picta.
minor.
Phleum pratense.
Phragmites Phragmites.
Poa alpina.
annua.
brevifolia.
caesia.
compressa.
flava.
nemoralis.
pratensis.
trivialis.
Savastana odorata.
Secale Dalmaticum.
fragile.
montanum.
Sesleria cylindrica.
elongata.
hirsuta.
Sorghum saccharatum.
vulgare.
Spartina cynosuroides.
aurea-marginata.
Sporobolus vaginaeflorus.
Syntherisma fimbriata.
linearis.
Themeda Forskalii.
Tricuspis seslerioides.
Tripsacum dactyloides.
Triticum monococcum.
Zea tunicata.

CYPERACEAE.

Carex arctica.
Asa-Grayi.
cephalophora.
crinita.
flexilis.
grisea.
laxiculmis.
laxiflora.
patulifolia.
lurida.
pallescens.

Carex pedicellata.
pubescens.
retrorsa.
rosea.
scoparia.
sterilis.
stricta.
trichocarpa.
Tuckermani.
typhinoides.
umbellata.
virescens.
vulpinoidea.
xanthocarpa.
Cyperus esculentus.
filiculmis.
strigosus.
Eleocharis ovata.
tenuis.
Scirpus atrovirens.
microcarpus.
zebrinus.

ARACEAE.

Acorus Calamus.
variegata.
Japonicus.
Arisaema Dracontium.
triphyllum.
Caladium esculentum.
Peltandra Virginica.
Sauromatum Simlense.
Spathyema foetida.

COMMELINACEAE.

Commelina Benghalensis.
coelestis.
communis.
tuberosa.
Tinantia fugax.
Tradescantia reflexa.
Virginiana.
occidentalis.

JUNCACEAE.

Juncoides campestre.
Juncus effusus.
tenuis.
Torreyi.

MELANTHACEAE.

Chamaelirium luteum.
Melanthium parviflorum.
Uvularia grandiflora.
nitida.
sessilifolia.
Veratrum viride.
Zygadenus elegans.
Nuttallii.

LILIACEAE.

Aletris farinosa.
Allium acuminatum.
album.
angulosum.
Babingtonii.
cernuum.
fistulosum.
fragrans.
Ledebourianum.
nutans.
odorum.
oleraceum.
Ophioscorodon.
Schoenoprasum.
senescens.
subhirsutum.
tricoccum.
vineale.
Asphodeline Liburnica.
Bessera elegans.
Calochortus Gunnisoni.
Erythronium Americanum.
Funkia albomarginata.
coerulea.
grandiflora.
undulata variegata.
Hemerocallis flava.
fulva.
Kwanso.
Thunbergii.
Hyacinthus candicans.
Leucocrinum montanum.
Lilium Canadense.
elegans.
Krameri.
Philadelphicum.
speciosum.

Lilium speciosum melporum.
praecox.
rubrum.
tigrinum (double).
splendens.
umbellatum.
Wallacei.
Milla biflora.
Ornithogalum umbellatum.
Paradisea Liliastrum.
Tricyrtis hirta.
Yucca angustifolia.
filamentosa.
glauca.
rupicola.

CONVALLARIACEAE.

Asparagus officinalis.
Convallaria majalis.
(pink.)
(striped foliage.)
Medeola Virginiana.
Polygonatum biflorum.
commutatum.
multiflorum.
Polygonatum.
verticillatum.
Streptopus roseus.
Trillium erectum.
Unifolium Canadense.
Vagnera amplexicaulis.
racemosa.
stellata.

AMARYLLIDACEAE.

Cooperia Drummondii.
Crinum Capense.
album.
roseum.
longifolium.
fimbriatulum.
Kirkii.
Moorei.
ornatum.
Hippeastrum Reginae.
Hymenocallis calathina.
Hypoxis hirsuta.
Pancratium Caribaeum.
Charlus albus.
Pancratium maritimum.
tortuosum.
Phaedranassa gloriosa.
Sprekelia formosissima.
Zephyranthes Andersoni.
Atamasco.
candida.
floribunda.
stricta.
sulphurea.

IRIDACEAE.

Gemmingia Chinensis.
Iris Caroliniana.
cristata.
Germanica.
Kaempferi.
lacustris.
laevigata.
Missouriensis.
prismatica.
pumila.
Sibirica.
atropurpurea.
orientalis.
polymnia.
verna.
versicolor.
Montbretia crocosmaeflora.
Sisyrinchium albidum.
augustifolium.
Atlanticum.
graminoides.
mucronatum.
Tritoma "John Benary."

CANNACEAE.

Canna sp.

ORCHIDACEAE.

Aplectrum hyemale.
Arethusa bulbosa.
Cypripedium acaule.
Calceolus.
hirsutum.
reginae.
Epipactis rubiginosa.
Gyrostachys Romanzoffiana.
Habenaria lacera.

Habenaria psychodes.
Leptorchis liliifolia.
Loeselii.
Limodorum tuberosum.
Orchis fusca.
latifolia.
maculata.
militaris.
pallens.
spectabilis.
Peramium Menziesii.
pubescens.
Tipularia unifolia.

DICOTYLEDONES.

URTICACEAE.

Urtica dioica.
gracilis.
Urticastrum divaricatum.

SANTALACEAE.

Comandra pallida.

ARISTOLOCHIACEAE.

Aristolochia Clematitis.
Asarum Canadense.
reflexum.

POLYGONACEAE.

Eriogonum Alleni.
campanulatum.
flavum.
microthecum diffusum.
umbellatum.
Fagopyrum cymosum.
Fagopyrum.
Polygonum amphibium.
aviculare.
compactum.
Convolvulus.
Persicaria.
punctatum.
Sachalinense.
sagittatum.
Virginianum.
Zuccarinii.
Rheum crassinervium.
Franzenbachii.
Rhaponticum.
Ribes.
tetragonopus.
undulatum.
Webbianum.
Rumex Acetosa.
alpinus.
Rumex altissimus.
confertus.
crispus.
cristatus.
hymenosepalus.
obtusifolius.
occidentalis.
Olympicus.
orientalis.
Patientia.
polygonifolius.
reticulatus.
salicifolius.
Steudelii.
venosus.
verticillatus.
vesicarius.

CHENOPODIACEAE.

Atriplex canescens.
hortensis.
Beta patula.
vulgaris.
Chenopodium album.
ambrosioides.
Botrys.
capitatum.
virgatum.
Hablitzia tamnoides.

AMARANTHACEAE.

Amaranthus aureus.
chlorostachys.
caudatus.
emarginatus.
giganteus.
hybridus paniculatus.
hypochondriacus.
racemosus.

Amaranthus retroflexus.
sanguineus.
speciosus.
Celosia argentea.

PHYTOLACCACEAE.

Phytolacca acinosa.
decandra.

NYCTAGINACEAE.

Abronia fragrans.
Allionia Nyctaginea.
Mirabilis Jalapa.

AIZOACEAE.

Mollugo verticillata.
Tetragonia crystallina.
expansa.

PORTULACACEAE.

Calandrinia pilosiuscula.
Claytonia Chamissoi.
lanceolata.
Virginica.

CARYOPHYLLACEAE.

Agrostemma bicolor.
Flos-Jovis.
Githago.
Alsine graminea.
Holostea.
media.
Arenaria serpyllifolia.
Cerastium alpinum.
arvense oblongifolium.
dichotomum.
hirsutum.
viscosum.
vulgatum.
Dianthus alpestris.
atrorubens.
barbatus.
capitatus.
Caucasicus.
ciliatus.
congestus.
cruentus.
cyclops.
deltoides.
fragrans.
Dianthus giganteus.
latifolius.
Liburnicus.
plumarius.
annulatus.
serotinus.
pubescens.
squarrosus.
superbus.
sylvaticus.
tenax.
tenuiflorus.
Gypsophila acutifolia.
paniculata.
Lychnis Chalcedonica.
Coronaria.
dioica.
Flos-cuculi.
Viscaria.
Saponaria officinalis.
Scleranthus annuus.
Silene acaulis.
Altaica.
Armeria.
Caroliniana.
catholica.
clandestina.
diurniflora.
flavescens.
Gallica.
Italica.
livida.
longicaulis.
longicilia.
longiflora.
Lusitanica.
maritima.
noctiflora.
obtusifolia.
pendula.
petraea.
quadrifida.
Saxifraga.
stellata.
Thorei.
undulata.
Virginica.
viridiflora.

Tunica prolifera.
Saxifraga.
Viscaria alpina.

RANUNCULACEAE.

Aconitum Columbianum.
Fischeri.
Lycoctonum.
Napellus.
Actaea alba.
spicata.
Adonis vernalis.
Anemone Canadensis.
cylindrica.
dichotoma.
multifida.
occidentalis.
quinquefolia.
Virginiana.
Aquilegia Canadensis.
chrysantha.
ciliata.
coerulea.
grandiflora alba.
Olympica.
Sibirica.
Skinneri.
vulgaris.
alba.
grandiflora.
Caltha leptosepala.
Cimicifuga racemosa.
Clematis Douglasii.
Fremontii.
integrifolia.
ochroleuca.
ovata.
recta.
stans.
Delphinium Carolinianum.
dictyocarpum.
elatum.
formosum.
intermedium.
Menziesii.
occidentalis.
scopulorum.
Sinense.
Delphinium Staphisagria.
Eranthis hyemalis.
Helleborus foetidus.
niger.
Hydrastis Canadensis.
Nigella Damascena.
Paeonia sp.
Pulsatilla hirsutissima.
Pulsatilla.
Ranunculus abortivus.
acris.
bulbosus.
delphinifolius.
hispidus.
inamoenus.
Nuttallii.
recurvatus.
septentrionalis.
Syndesmon thalictroides.
Thalictrum angustifolium.
aquilegiifolium.
coriaceum.
dioicum.
elatum.
Fendleri.
flavum.
glaucescens.
glaucum.
minus concinnum.
elatum.
purpurascens.
nigrescens.
polygamum.
squarrosum.
sylvaticum.
Trollius Europaeus.
laxus.
albiflorus.
Xanthorrhiza apiifolia.

BERBERIDACEAE.

Caulophyllum thalictroides.
Jeffersonia diphylla.
Podophyllum peltatum.
Vancouveria hexandra.

PAPAVERACEAE.

Argemone grandiflora.
hispida.

Argemone Mexicana.
platyceras.
speciosa.
Bocconia cordata.
Eschscholtzia glauca.
Glaucium flavum.
luteum.
rubrum.
Papaver Caucasicum.
croceum.
nudicaule.
orientale.
pilosum.
Rhoeas.
rupifragum Atlanticum.
Sanguinaria Canadensis.
Stylophorum diphyllum.

FUMARIACEAE.

Bicuculla Cucullaria.
spectabilis.
Capnoides sempervirens.

CRUCIFERAE.

Alyssum argenteum.
articulatum.
calycinum.
edentulum.
petraeum.
saxatile.
sinuatum.
Arabis albida.
Allionii.
hirsuta.
lucida.
pumila.
rosea.
Stelleri.
Turrita.
Aubrietia deltoides.
Eyrei.
purpurea.
Barbarea arcuata.
Barbarea.
bracteosa.
Biscutella auriculata.
ciliata.
Brassica campestris.
Bunias orientalis.
Camelina sativa.
Cardamine cordifolia.
Cheiranthus Cheiri.
Dentaria maxima.
Draba aizoides.
hispida.
incana.
nemorosa.
Erysimum asperum.
cheiranthoides.
hieracifolium.
peninsulare.
Perofskianum.
pulchellum.
strictum.
virgatum.
Euclidium Syriacum.
Farsetia clypeata.
eriocarpa.
Hesperis matronalis.
Iberis affinis.
corifolia.
decipiens.
Gibraltarica hybrida.
Pruiti.
Sibirica.
Isatis praecox.
tinctoria.
Koniga maritima.
Lepidium graminifolium.
Lunaria annua.
rediviva.
Physaria didymocarpa.
Rapistrum Linnaeanum.
Roripa palustris.
Sinapis alba.
Allionii.
Sisymbrium Austriacum.
Stanleya pinnata.
Thlaspi alpestre.
arvense.

CAPPARIDACEAE.

Cleome Candelabrum.
serrulata.
Isomeris arborea.
Polanisia graveolens.
trachysperma.

RESEDACEAE.

Reseda alba.
glauca.
lutea.
Luteola.

CRASSULACEAE.

Sedum acre.
Aizoon.
atropurpureum.
Ewersii.
Hispanicum.
hybridum.
Japonicum.
Maximowiczii.
rhodanthum.
sexangulare.
speciosum.
spectabile.
album.
stenopetalum.
stoloniferum.
telephioides.
Telephium.
ternatum.
Sempervivum arachnoideum.
cuneatum.
Ruthenicum.
tectorum.
Verloti.

SAXIFRAGACEAE.

Astilbe Japonica.
Heuchera Americana.
bracteata.
parvifolia.
pubescens.
ribifolia.
sanguinea.
alba.
Wheeleri.
Parnassia Caroliniana.
Peltaphyllum peltatum.
Saxifraga acaulis.
Aizoon.
caespitosa.
cordifolia.
Cotyledon.
Saxifraga latifolia.
nivalis.
Pennsylvanica.
speciosa.
Virginiensis.
Tiarella cordifolia.

ROSACEAE.

Acaena myriophylla.
ovalifolia.
sarmentosa.
Agr monia odorata.
parviflora.
repens.
striata.
Alchemilla vulgaris.
Argentina Anserina.
Aruncus Aruncus.
astilboides.
Comarum palustre.
Comocarpa fruticosa.
Dalibarda repens.
Dryas octopetala.
Fragaria glauca.
vesca.
Virginiana.
Geum Canadense.
Chiloense.
ciliatum.
coccineum.
hispidum.
macrophyllum.
rivale.
rugosum.
strictum.
Porteranthus trifoliatus.
Potentilla alpestris.
argentea.
argentea × verna.
argyrophylla.
atrosanguinea.
biennis.
Canadensis.
collina.
desertorum.
digitata × flabellata.
geoides.
glandulosa.

Potentilla Goldbachii.
gracilis.
rigida.
heptaphylla.
Herbichii.
Hippiana.
hirta.
Kotschyana.
Kurdica.
Macnabiana.
Monspeliensis.
Montenegrina.
Nepalensis.
ontopoda.
Pennsylvanica.
arachnoides.
Piersii.
pseudo-chrysantha.
pulcherrima.
pumila.
recta laciniata.
rupestris.
Sanguisorba.
Schrenkiana.
tanacetifolia.
Vlasicensis.
Purshia tridentata.
Rubus parviflorus.
Sanguisorba Canadensis.
lateriflora.
myriophylla.
Sanguisorba.
tenuifolia.
Sibaldiopsis tridentata.
Ulmaria filipendula.
palmata.
Ulmaria.
Waldsteinia fragarioides.

CAESALPINACEAE.

Cassia Chamaecrista.
Marylandica.
nictitans.

PAPILIONACEAE.

AEschynomene Indica.
Amorpha nana.
Anthyllis Vulneraria.
Astragalus alpinus.
Astragalus Carolinianus.
chlorostachys.
Cicer.
Drummondii.
falcatus.
flexuosus.
galegiformis.
Glycyphyllos.
hamosus.
Hypoglottis.
white-flowered.
Laxmanii.
Narbonensis.
Parryi.
Ponticus.
racemosus.
Shortianus.
Sinensis.
sulcatus.
tridactylicus.
vicioides.
Baptisia australis.
leucantha.
perfoliata.
tinctoria.
Caragana albogana.
Colutea arborescens.
Coronilla Cretica.
Dolichos sesquipedalis.
Falcata comosa.
Galega officinalis.
Persica.
Genista tinctoria.
Glycine hispida.
Soja.
Glycyrrhiza echinata.
lepidota.
Hedysarum coronarium.
Mackenzii.
Indigofera tinctoria.
Kuhnistera candida.
purpurea.
tenuifolia.
Lathyrus alatus.
Aphaca.
articulatus.
azureus.
Clymenum.

Lathyrus decaphyllus.
ensifolius.
hirsutus.
Langei.
latifolius.
Ochrus.
platyphyllus.
Pyrenaicus.
sativus.
sylvestris.
Tingitanus.
venosus.
Lespedeza bicolor.
capitata.
hirta.
procumbens.
violacea.
Lotus Americanus.
edulis.
tenuis.
Lupinus argenteus.
bicolor.
elegans.
Dunnettii.
micranthus.
Nutkatensis.
parviflorus.
polyphyllus.
propinquus.
sericeus.
Medicago aculeata
agrestis.
ambigua.
arenaria.
Blancheana.
Carstiensis.
cylindracea.
Decandollei.
denticulata.
depressa.
elegans.
flexuosa.
Gerardi.
globulosa.
glutinosa.
Hystrix.
interrupta.
laevis.
Medicago Lappacea.
littoralis.
lupulina.
nigra.
sativa.
scutellata.
subinermis.
Tenoreana.
Terebellum.
tornata.
tribuloides.
tuberculata.
Meibomia Canadensis.
Dillenii.
Illinoensis.
nudiflora.
paniculata.
penduliflora.
viridiflora.
Melilotus alba.
Italica.
officinalis.
Onobrychis Caput-galli.
Crista-galli.
montana.
sativa.
vaginalis.
Ononis alopecuroides.
arvensis.
maritima.
spinosa alba.
Phaseolus albiflorus.
amethystinus.
Capensis.
coccineus.
compressus.
diversifolius.
Japonicus.
multiflorus.
Mungo.
nanus.
subroseus.
vulgaris.
Wightianus.
Pisum elatius.
maritimus.
Psoralea Onobrychis.
physodes.

Psoralea pinnata.
Rhynchosia volubilis.
Scorpiurus muricata.
vermiculata.
Securigera Coronilla.
Sophora sericea.
Spartium junceum.
Spiesia glabra.
Lamberti.
spicata.
splendens.
Strophostyles helvola.
Tetragonolobus biflorus.
Thermopsis Caroliniana.
montana.
rhombifolia.
Trifolium agrarium.
dasyphyllum.
hybridum
incarnatum.
pratense.
repens.
pictum.
Trigonella coerulea.
Foenum-graecum.
Monspeliaca.
Vicia Americana.
amphicarpa.
atropurpurea.
Cracca.
dumetorum.
ferruginea.
gigantea.
hybrida.
Leavenworthii.
lutea.
Narbonensis.
peregrina.
picta.
sativa.
tetrasperma.
Vigna Sinensis.

GERANIACEAE.

Erodium ciconium.
cicutarium.
gruinum.
macrophyllum.
Geranium asphodeloides.
collinum.
columbinum.
cristatum.
divaricatum.
Fremontii.
incisum.
maculatum.
pratense album.
Pyrenaicum.
Richardsonii.
rivulare.
sanguineum.
Sibiricum.
Wilfordi.

TROPAEOLACEAE.

Tropaeolum majus.
minus.

OXALIDACEAE.

Oxalis corniculata stricta.
cymosa.
grandis.
violacea.

LINACEAE.

Linum Altaicum.
Lewisii.
nervosum.
perenne.
Virginianum.

RUTACEAE.

Dictamnus Fraxinella.
Ruta graveolens.

POLYGALACEAE.

Polygala paucifolia.
Senega.

EUPHORBIACEAE.

Euphorbia corallata.
Cyparissias.
dendroides.
Esula.
heterophylla.
Lathyris.
Liburnica.
Nicaeensis.
Peplus.
platyphylla.
polygona.

Euphorbia robusta.
spongiosa.
Terracina.
variabilis.
Mercurialis annua.
perennis.
Ricinus communis.

LIMNANTHACEAE.

Limnanthes Douglasii.

BALSAMINACEAE.

Impatiens Balsamina.
biflora.

MALVACEAE.

Abutilon Abutilon.
Althaea cannabina.
ficifolia.
rosea.
Heldreichii.
Kirrindensis.
officinalis.
pallida.
rosea.
sulphurea.
Taurinensis.
Anoda hastata.
Wrightii.
Callirrhoë involucrata.
Hibiscus militaris.
Moscheutos.
albus.
Trionum.
Kitaibelia vitifolia.
Lavatera arborea.
Mauritianica.
Thuringiaca.
trimestis.
Malope grandiflora.
Malva Abyssinica.
Alcea.
Mauritianica.
moschata alba.
oxyloba.
sylvestris.
alba.
verticillata.
crispa.
Malvastrum coccineum.
Limense.
Sida carpinifolia.
hermaphrodita.
rhombifolia.
Sidalcea candida.

HYPERICACEAE.

Ascyrum hypericoides.
Hypericum Androsaemum.
Ascyron.
atomarium.
aureum.
Drummondii.
Kalmianum.
maculatum.
Moserianum.
mutilum.
orientale decussatum.
prolificum.
Sarothra gentianoides.

CISTACEAE.

Helianthemum Canadense.
Lechea Leggettii.
minor.
villosa.

VIOLACEAE.

Cubelium concolor.
Viola Banatica.
blanda.
amoena.
Brittoniana.
Canadensis.
canina.
adunca.
cornuta.
cucullata.
domestica.
emarginata.
Labradorica.
lanceolata.
obliqua.
ovata.
palmata.
dilatata.
papilionacea.
pedata.
pedatifida.
polychroma.
primulaefolia.

Viola rostrata.
rotundifolia.
sagittata.
scabriuscula.
Selkirkii.
sororia.
striata.
sylvestris.
tricolor.
villosa.

LOASACEAE.

Mentzelia laevicaulis.
nuda.

CACTACEAE.

Cactus Missouriensis.
viviparus.
Echinocactus Simpsoni.
minor.
Echinocereus viridiflorus.
Opuntia fragilis.
humifusa.
mesacantha Greenei.
macrorrhiza.
Opuntia.
polyacantha.
albospina.

LYTHRACEAE.

Lythrum alatum.
Salicaria.

ONAGRACEAE.

Anogra albicaulis.
pallida.
Chamaenerion angustifolium.
Circaea Lutetiana.
Epilobium Abyssinicum.
montanum.
trigonum.
Gaura coccinea.
Lindheimeri.
parviflora.
Kneiffia Fraseri.
pumila.
riparia.
Lavauxia brachycarpa.
Ludwigia alternifolia.
Meriolix serrulata.
OEnothera cruenta.
Lamarckiana.
OEnothera parviflora.
rhombipetala.
rosea.
spectabilis.
Onagra biennis.
grandiflora.
Oakesiana.
Pachylophus caespitosus.

ARALIACEAE.

Aralia hispida.
nudicaulis.
racemosa.
Panax quinquefolia.
trifolia.

UMBELLIFERAE.

Agasyllis Caucasica.
Aletes acaulis.
Angelica atropurpurea.
officinalis.
villosa.
Apium graveolens.
Petroselinum.
Berula erecta.
Bupleurum prostratum.
Calisace Dahurica.
Carum Carui.
Kelloggii.
Caucalis nodosa.
Cicuta maculata.
Conium maculatum.
Coriandrum sativum.
Daucus Carota.
Mexicanus.
Deringa Canadensis.
Eryngium aquaticum.
Billardieri.
campestris.
coeruleum.
petiolatum.
planum.
Foeniculum officinale.
Heracleum gummiferum.
lanatum.
Hydrocotyle Americana.
Laserpitium hispidum.
Ligusticum apiifolium.
ferrulaceum.
Musineon trachysperma.

OEnanthe Lachenalii.
peucedanifolia.
Orlaya grandiflora.
Pastinaca sativa.
Peucedanum verticillare.
Pimpinella aromatica.
Tragium.
Sanicula gregaria.
Scandix Balansae.
Persica.
Selinum coniifolium.
Seseli glabrum.
gummiferum.
osseum.
Pallasii.
Washingtonia Claytoni.
nuda.
Zizia aurea.
Bebbii.
cordata.

PYROLACEAE.

Chimaphila maculata.
Pyrola elliptica.
rotundifolia.

ERICACEAE.

Gaultheria procumbens.

PRIMULACEAE.

Anagallis arvensis.
coerulea.
Androsace coronopifolia.
elongata.
septentrionalis.
Dodecatheon Hendersonii.
Meadia.
var.
pauciflora.
Lysimachia atropurpurea.
Nummularia.
punctata.
quadrifolia.
terrestris.
vulgaris.
Primula vulgaris.
Steironema ciliatum.

PLUMBAGINACEAE.

Limonium latifolium.
Plumbago Larpentae.
Statice Armeria.
plantaginea.
setacea.

GENTIANACEAE.

Frasera speciosa.
Gentiana Andrewsii.
Bigelovii.
Oregona.
Parryi.
Saponaria.
Swertia perennis.

APOCYNACEAE.

Amsonia Amsonia.
latifolia.
Apocynum androsaemifolium.
cannabinum.

ASCLEPIADACEAE.

Acerates auriculata.
viridiflora.
Asclepias incarnata.
pulchra.
quadrifolia.
speciosa.
Sullivantii.
Syriaca.
tuberosa.
verticillata.
pumila.
Cynanchum acutum.
Leptadenia heterophylla.
Vincetoxicum obliquum.

CONVOLVULACEAE.

Convolvulus arvensis.
incanus.
luteolus purpuratus.
repens.
Sepium.
Evolvulus argenteus.
Ipomoea leptophylla.
pandurata.
purpurea.

POLEMONIACEAE.

Gilia pungens.
Phlox amoena.
divaricata.
Douglasii.
glaberrima.

Phlox paniculata.
pilosa.
subulata.
Polemonium coeruleum.
album.
confertum mellitum.
Himalayanum.
humile.
lacteum.
reptans.
Van Bruntiae.

HYDROPHYLLACEAE.

Hydrophyllum Canadense.
occidentale.
Virginicum.

BORAGINACEAE.

Anchusa altissima.
Italica.
officinalis.
Cerinthe minor.
Cynoglossum bicolor.
furcatum.
Magellenense.
Nebrodense.
officinale.
pictum.
Echium violaceum.
Krynitzkia Jamesii.
Lindelofia spectabilis.
Lithospermum angustifolium.
multiflorum.
Mertensia lanceolata.
Sibirica.
Virginica.
Myosotis collina.
palustris.
Omphalodes linifolia.
Onosmodium Carolinianum.
Symphytum echinatum.
officinale.

VERBENACEAE.

Caryopteris Mastacanthus.
Lippia cuneifolia.
Verbena Aubletia.
hastata.
officinalis.
pulchella.
Verbena urticifolia.
venosa.

LABIATAE.

Agastache anethiodora.
nepetoides.
rugosa.
Ajuga pyramidalis.
reptans.
variegata.
Ballota Italica.
lanata.
Clinopodium Acinos.
alpinum.
nepetoides.
Collinsonia Canadensis.
Cunila origanoides.
Dracocephalum Ruyschianum.
Galeopsis versicolor.
Glechoma hederacea.
Hyssopus officinalis.
aristatus.
Koellia flexuosa.
mutica.
Virginiana.
Lamium maculatum.
Leonurus Cardiaca.
Sibiricus.
Lycopus Europaeus.
exaltatus.
rubellus.
sinuatus.
Virginicus.
Marrubium leonuroides.
vulgare.
Melissa officinalis.
Mentha aquatica.
Canadensis.
crispa.
gentilis.
nemorosa.
piperita.
spicata.
Monarda didyma.
fistulosa.
media.
Nepeta Cataria.
grandiflora.
latifolia.

Nepeta nuda.
Reichenbachiana.
Origanum vulgare.
Phlomis tuberosa.
viscosa.
Physostegia Virginiana.
Plectranthus glaucocalyx
Prunella vulgaris.
Pyrenaica.
Salvia argentea.
azurea.
confusa.
glutinosa.
Hispanica.
Horminum.
limbata.
nemorosa.
officinalis.
Pitcheri.
pratensis.
Regeliana.
Sclarea.
Sibthorpi.
spathacea.
tiliaefolia.
verbenacea.
rubella.
virgata.
Scutellaria albida.
alpina.
altissima.
lateriflora.
Sideritis hyssopifolia.
lanata.
Stachys Betonica.
alba.
hirsuta.
hyssopifolia.
lanata.
setifera.
sylvatica.
tenuifolia.
Teucrium Botrys.
Chamaedrys.
Scorodonia.
crispum.

SOLANACEAE.

Atropa Belladonna.
Datura gigantea.
Metel.
Tatula.
Hyoscyamus niger.
Nicotiana alata.
glutinosa.
rustica.
Physalis angulata.
Francheti.
heterophylla.
lobata.
Saracha Jaltomata.

SCROPHULARIACEAE.

Castilleja integra.
linariaefolia.
pallida.
Celsia Pontica.
Chelone glabra.
Lyoni.
Digitalis ambigua.
ferruginea.
gloxinoides.
grandiflora.
lanata.
lutea.
media.
ochroleuca.
orientalis.
purpurea.
Erinus alpinus.
Hebenstreitia tenuifolia.
Leptandra Virginica.
Linaria bipartita splendens.
Dalmatica.
Linaria.
littoralis.
Peloponnesiaca.
purpurea.
striata.
Melampyrum lineare.
Mimulus alatus.
Pedicularis bracteosa.
Groenlandica.
procera.
Pentstemon acuminatus.
barbatus.
Torreyi.
campanulatus angustifolius.

Pentstemon canescens
coeruleus.
confertus.
cyanthus.
diffusus.
glaber.
hirsutus.
laevigatus.
Richardsonii. ?
rubicaulis.
Scrophularia alata.
aquatica.
leporella.
nodosa.
Scorodonia.
Verbascum Blattaria.
Cedreti.
Libani.
nigrum.
phlomoides.
Thapsus.
virgatum.
Veronica Byzantina.
Chamaedrys.
corymbosa variegata.
exaltata.
fruticulosa.
incisa.
latifolia.
longifolia.
maritima.
alba.
officinalis.
rupestris.
serpyllifolia.

PEDALIACEAE.

Martynia fragrans.

ACANTHACEAE.

Justicia procumbens.
Ruellia ciliosa.
strepens.

PLANTAGINACEAE.

Plantago arenaria.
cordata.
Cynops.
lanceolata.
major rubra.
sinuata.
Plantago media.
purpurascens.
Rugelii.
Virginica.

RUBIACEAE.

Asperula aureo-setosa.
galioides.
glomerata.
Crucianella AEgyptica.
Galium aristatum.
boreale.
circaezans.
elatum.
erectum.
Mollugo.
pilosum.
recurvum.
tenuissimum.
tricorne.
trifiorum.
verum.
Houstonia coerulea.
longifolia.
Mitchella repens.
Rubia tinctoria.
Sherardia arvensis.

CAPRIFOLIACEAE.

Triosteum angustifolium.
perfoliatum.

VALERIANACEAE.

Centranthus ruber.
albus.
Valeriana edulis.
officinalis.
Valerianella vesicaria.

DIPSACEAE.

Cephalaria leucantha.
radiata.
Tatarica.
Transylvanica.
Dipsacus fullonum.
laciniatus.
sylvestris.
Knautia arvensis.
Scabiosa calocephala.
Caucasica.
Columbaria.

Scabiosa crenata.
fumariaefolia.
Japonica.
micrantha.
prolifera.
Ucranica.
vestina.
Succisa australis.

CUCURBITACEAE.

Apodanthera undulata.
Cobalium elaterium.
Cyclanthera explodens.

CAMPANULACEAE.

Adenophora lilifolia.
suaveolens.
Campanula alliariaefolia.
Carpatica.
celtidifolia.
Cervicaria.
lamiifolia.
latifolia.
Medium.
punctata.
rapunculoides.
rotundifolia.
Ruthenica.
tomentosa.
Trachelium.
Jasione perennis.
Phyteuma betonicaefolium.
Platycodon grandiflorum.
Maresii.

CICHORIACEAE.

Achryophorus pinnatifidus.
Adopogon Carolinianum.
Virginicum.
Barkhausia rubra.
Cichorium pumilum.
Crepis blattarioides.
Candollei.
lampsanoides.
Hedypnois Cretica.
Hieracium alpinum.
amplexicaule.
aurantiacum.
buglossoides.
calycinum.
Hieracium flagellare.
Greenii.
incisum.
iricum.
Jankae.
lactucaefolium.
lampsanoides.
lasiophyllum.
lingulatum.
maculatum.
Marianum.
nitidum.
pallidum.
Pilosella.
pratense.
pulmonarioides.
Reichenbachii.
rubescens.
scabrum.
stoloniferum.
tridentatum.
venosum.
vulgatum.
Hyoseris radiata.
Hypochoeris glabra.
Lactuca Canadensis.
perennis.
Plumieri.
spicata.
virosa.
Leontodon hastilis.
Nabalus albus.
racemosus.
trifoliolatus.
Picridium Hispanicum.
Picris echioides.
Pyrenaica.
Rodigia commutata.
Sitilias Caroliniana.
Taraxacum erythrospermum.
Taraxacum.
Tolpis barbata.
Zacintha verrucosa.

AMBROSIACEAE.

Ambrosia artemisiaefolia.
trifida.
Xanthium Italicum.
macrocarpum.

Xanthium spinosum.
Strumarium.

COMPOSITAE.

Achillea Ageratum.
asplenifolia.
cartilaginea.
Clavennae.
coronopifolia.
grandiflora.
impatiens.
Millefolium.
rubra.
Neilreichii.
Ptarmica alba.
Pyrenaica.
Reichardtiana.
rosea.
serrata.
Sibirica.
speciosa.
stricta.
Acroclinium roseum.
Actinella acaulis.
Anaphalis margaritacea.
Antennaria alpina.
Canadensis.
Carpatica pulcherrima.
dioica.
luzuloides.
neglecta.
neo-dioica.
Parlinii.
plantaginifolia.
Anthemis altissima.
Austriaca.
pallida.
rigescens.
tinctoria.
trifoliata.
Aplopappus Parryi.
Arachnospermum heterospermum.
Arctium minus.
nemorosum.
tomentosum.
Arnica alpina.
longifolia.
Artemisia annua.
Artemisia arbuscula.
capillaris.
filifolia.
frigida.
Ludoviciana.
Pontica.
Stelleriana.
Aster Amellus.
azureus.
divaricatus.
Drummondii.
Faxoni.
laevis.
lateriflorus.
Lowrieanus.
macrophyllus.
Novae-Angliae.
Porteri.
ptarmicoides.
puniceus.
salicifolius.
Sibiricus.
Tradescanti.
violaris.
Bidens frondosa.
leucantha.
pilosa.
Schimperi.
Bigelovia graveolens.
Boltonia asteroides.
latisquamea.
Brauneria purpurea.
Buphthalmum speciosum.
Cacalia hastata.
Calendula arvensis.
officinalis.
Carduus crispus.
eriocephalus.
horridus.
Pannonicus divaricatus.
serratus.
spinosissimus.
trichodenia.
Carlina acaulis.
Catananche coerulea.
Centaurea atropurpurea.
calcitrapoides.
cirrata.

Centaurea diluta.
eriophora.
Crocodylium.
Friderici.
Jacea.
macrocephala.
microptilon.
nigrescens.
Orphanidea.
pratensis.
salicifolia.
Salmantica.
Scabiosa.
spinulosa.
sulphurea.
transalpina.
Chrysanthemum Balsamita.
carinatum.
corymbosum.
lacustre.
Leucanthemum.
macrophyllum.
montanum.
Parthenium.
praealtum.
segetum.
uliginosum.
viscosum.
Chrysopsis falcata.
villosa.
Cnicus benedictus.
Coleosanthus grandiflorus.
Conyza longifolia.
Coreopsis angustifolia.
Atkinsoniana.
auriculata.
bicolor.
cardaminifolia.
lanceolata.
latifolia.
rosea.
tripteris.
verticillata.
Cryptostemma calendulaceum.
Cynara Scolymus.
Dahlia coccinea.
gracilis.
Merckii.
Dahlia superflua.
variabilis.
Dimorphotheca annua.
Echinais carlinoides.
Echinops Persicus.
sphaerocephalus.
Erigeron acris.
compositus.
flagellaris.
glabellus.
glaucus.
linifolius.
macranthus.
pulchellus.
speciosus.
Eupatorium ageratoides.
cannabinum.
maculatum.
purpureum.
Euthamia lanceolata.
leptocephala.
Gaillardia aristata.
pulchella.
Galinsoga brachystephana.
Gerbera nivea.
Grindelia inuloides.
rubicaulis maritima.
Guizotia oleifera.
Gutierrezia Euthamiae.
Helenium Hoopesii.
striatum grandicephalum.
Helianthella quinquenervis.
Helianthus annuus.
giganteus.
grosse-serratus.
laetiflorus.
Maximiliani.
mollis.
occidentalis.
orgyalis.
pumilus.
rigidus.
strumosus.
tuberosus.
Heliopsis helianthoides.
Hymenopappus filifolius.
Inula Conyza.
ensifolia.

Inula Helenium.
salicina.
thapsoides.
Jurinea alata.
Kentrophyllum lanatum.
Kuhnia eupatorioides.
Lacinaria cylindrica.
punctata.
pycnostachya.
spicata.
Lapsana communis.
intermedia.
Leontopodium alpinum.
Lindheimeria Texana.
Lonas inodora.
Lygodesmia juncea.
Madia capitata.
elegans.
sativa.
Maruta Cotula.
Matricaria matricarioides.
glabra.
Mesadenia atriplicifolia.
Microseris Lindleyi.
Notobasis Syriaca.
Onopordon Illyrium.
Parthenium integrifolium.
Petasites palmata.
Petasites.
Picris echioides.
Polymnia Canadensis.
Ratibida columnaris.
pinnata.
Rudbeckia digitata.
laciniata.
maxima.
speciosa.
triloba.
Santolina incana.
pectinata.
Scolymus maculatus.
Scorzonera Hispanica.
Senecio antennariifolius.
aureus.
Balsamitae.
chrysanthemifolius.
diversifolius.
Doria.
Douglasii.
Senecio Fendleri.
macrophyllus.
viscosus.
Serratula coronata.
macrophylla.
heterophylla.
Siegesbeckia orientalis.
Silphium laciniatum.
perfoliatum.
scaberrimum.
trifoliatum.
Solidago arguta.
Boottii.
caesia.
Canadensis.
flexuosa.
gigantea.
juncea.
Missouriensis.
Riddellii.
rigida.
rugosa.
Virga-aurea.
Sphenogyne anthemoides.
Stokesia cyanea.
Synosma suaveolens.
Tagetes Lemmoni.
Tanacetum boreale.
Huronense.
vulgare.
crispum.
Thelesperma ambiguum.
gracile.
Townsendia sericea.
Tragopogon longifolius.
Tussilago Farfara.
Urospermum Capense.
Verbesina alternifolia.
encelioides.
helianthoides.
pauciflora.
procera.
tetraptera.
Vernonia Arkansana.
Xeranthemum cylindraceum.
Zinnia aurea.
elegans.
Haageana.
verticillata.

C. FRUTICETUM.

SALICACEAE.

Salix discolor.
humilis.
tristis.

MYRICACEAE.

Comptonia peregrina.
Myrica Carolinensis.

BETULACEAE.

Alnus rugosa.
Betula pumila fastigiata.
Corylus Americana.
Avellana.
Pontica.
purpurea.

FAGACEAE.

Quercus humilis.

ULMACEAE.

Planera cuspidata.
Zelkova acuminata.

MORACEAE.

Morus Tatarica.

TROCHODENDRACEAE.

Cercidiphyllum Japonicum.

RANUNCULACEAE.

Paeonia Moutan.
Xanthorrhiza apiifolia.

BERBERIDACEAE.

Berberis Canadensis.
purpurea.
Sieboldii.
Thunbergii.
virescens.
vulgaris.

CALYCANTHACEAE.

Butneria fertilis.

ANONACEAE.

Asimina triloba.

LAURACEAE.

Benzoin Benzoin.

SAXIFRAGACEAE.

Deutzia crenata.
gracilis.
parviflora.
Sieboldi.
Hydrangea arborescens.
Otaksa.
paniculata grandiflora.
radiata.
Itea Virginica.
Philadelphus coronarius.
grandiflorus.

GROSSULARIACEAE.

Ribes aureum.
Diacantha.
fasciculatum Chinense.
floridum.
oxyacanthoides.
sanguineum.

HAMAMELIDACEAE.

Corylopsis spicata.
Hamamelis Virginiana.

ROSACEAE.

Exochorda grandiflora.
Neviusia Alabamensis.
Opulaster opulifolius.
Rhodotypus kerrioides.
Rosa blanda.
Carolina.
cinnamomea.
humilis.
multiflora.
rubiginosa.
rugosa.
Rubus deliciosus.
odoratus.
villosus.
Spiraea Amurensis.
Bumalda.
callosa.
carpinifolia.
cuneifolia.
Hookeri.
Reevesiana.
rotundifolia.
salicifolia.
sorbifolia.
Thunbergii.
tomentosa.
alba.
vaccinifolia.

Stephanandra flexuosa.

POMACEAE.

Amelanchier Botryapium.
Arouia arbutifolia.
nigra.
Cotoneaster obtusa.
Simonsii.
Wheeleri.
Crataegus glandulosa.
punctata.
Pyrus Parkmanni.

DRUPACEAE.

Prunus Americana.
maritima.
Padus.
Pissardi.
Virginiana.

CAESALPINIACEAE.

Cercis Canadensis.
Japonica.

PAPILIONACEAE.

Amorpha fruticosa.
Caragana arborescens.
Coronilla Emerus.
Genista capitata.
Lespedeza bicolor.
Robinia hispida.
Sophora violacea.

RUTACEAE.

Citrus trifoliata.
Ptelea trifoliata.
Xanthoxylum Americanum.
piperitum.

ANACARDIACEAE.

Cotinus Cotinus.
Rhus aromatica.
copallina.
glabra.

ILICACEAE.

Ilex Sieboldi.
verticillata.

CELASTRACEAE.

Euonymus alatus.
Americanus.
atropurpureus.
Europaeus.
radicans.

STAPHYLEACEAE.

Staphylea Colchica.
trifolia.

HIPPOCASTANACEAE.

AEsculus parviflora.

SAPINDACEAE.

Sapindus marginatus.
Xanthoceras sorbifolia.

RHAMNACEAE.

Ceanothus Americanus.
Paliurus aculeatus.
Rhamnus alpina.
Carolina.
cathartica.
crenulata.

MALVACEAE.

Hibiscus Syriacus.

THEACEAE.

Stuartia pentagyna.

HYPERICACEAE.

Hypericum calycinum.
densiflorum.
patulum.
proliferum.

TAMARICACEAE.

Tamarix Africana.
Gallica.
Indica.

THYMELEACEAE.

Dirca palustris.

ELAEAGNACEAE.

Elaeagnus hortensis.
parviflora.
umbellata.

ARALIACEAE.

Aralia pentaphylla.
Dimorphanthus Mandschuricus.

CORNACEAE.

Cornus alternifolia.
Amonum.
candidissima.
circinata.
Mas.
sanguinea.
stolonifera.

CLETHRACEAE.
Clethra alnifolia.
canescens.
ERICACEAE.
Leucothoë Catesbaei.
VACCINIACEAE.
Vaccinium vacillans.
STYRACACEAE.
Pterostyrax hispidum.
Styrax Japonicum.
OLEACEAE.
Chionanthus Virginica.
Forsythia suspensa.
viridissima.
Ligustrum buxifolium.
Ibota.
medium.
ovalifolium.
Syringa Pekinensis.
VERBENACEAE.
Callicarpa Japonica.
CAPRIFOLIACEAE.
Diervilla sessilifolia.
Lonicera fragrantissima.
Ledebourii.
Morrowi.
orientalis.
Phylomelae.
Standishii.
Xylosteum.
Symphoricarpos racemosus.
Symphoricarpos.
Viburnum acerifolium.
cassinoides.
cotinifolium.
dentatum.
Lantana.
Lentago.
molle.
Nepalense.
Opulus.
phlebotrichum.
plicatum.
prunifolium.
pubescens.
Sieboldi.

D. ARBORETUM.

(Including species naturally growing in the grounds.)

GINKGOACEAE.
Ginkgo biloba.
TAXACEAE.
Taxus acuminata.
compacta.
baccata.
pyramidalis.
Canadensis.
cuspidata.
PINACEAE.
Juniperus Virginiana.
Larix laricina.
Pinus Austriaca.
contorta.
densifolia.
divaricata.
excelsa.
Strobus.
sylvestris.
Thunbergii.
Tsuga Canadensis.
JUGLANDACEAE.
Hicoria alba.
microcarpa.
minima.
ovata.
Juglans cinerea.
nigra.
regia.
SALICACEAE.
Populus alba.
grandidentata.
tremuloides.
Salix alba vitellina.
Babylonica.
nigra.
BETULACEAE.
Alnus glutinosa.
incana.
Japonica.
Oregona.
sp.

Alnus sp.
Betula Ermani.
Japonica.
lenta.
nigra.
papyrifera.
populifolia.
ulmifolia.
Carpinus Caroliniana.
Ostrya Virginiana.

FAGACEAE.

Castanea dentata.
Japonica.
Fagus Americana.
Quercus alba.
coccinea.
imbricaria.
macrocarpa.
Michauxii.
palustris.
Phellos.
platanoides.
Robur.
rubra.
velutina.

ULMACEAE.

Celtis occidentalis.
Ulmus alata.
Americana.
campestris.
crassifolia.
racemosa.

MORACEAE.

Broussonetia Kaempferi.
Morus rubra.
Toxylon pomiferum.

TROCHODENDRACEAE.

Cercidiphyllum Japonicum.

MAGNOLIACEAE.

Liriodendron Tulipifera.
fastigiata.
variegata.
Magnolia acuminata.
tripetala.

LAURACEAE.

Sassafras Sassafras.

HAMAMELIDACEAE.

Liquidambar Styraciflua.

PLATANACEAE.

Platanus occidentalis.
orientalis.

POMACEAE.

Crataegus cordata.
Oxyacantha.
Malus coronaria.
Malus.
Soulardi.
Photinia villosa.
Pyrus baccata.
edulis.
sinuata.
communis.
melanocarpa.
microcarpa.
prunifolia.
flava.
intermedia.
macrantha.
rivularis.
spectabilis fl. pl.
Toringo.
sp.
sp.
Sorbus Americana.
Aucuparia.

DRUPACEAE.

Prunus Avium.
divaricata.
myrobalana.
Pseudocerasus.
serotina.
Simonii.
sp.

CAESALPINACEAE.

Gleditsia triacanthos.

PAPILIONACEAE.

Robinia Pseudacacia.

RUTACEAE.

Cedrela Sinensis.
Phellodendron Amurense.
Japonicum.

SIMARUBACEAE.

Ailanthus glandulosa.

ANACARDIACEAE.

Cotinus cotinoides.
Rhus hirta.
Osbeckii.

ILICACEAE.

Ilex opaca.

ACERACEAE.

Acer campestre.
Negundo.
Pennsylvanicum.
platanoides.
Pseudo-Platanus.
rubrum.
saccharinum.
Saccharum.

TILIACEAE.

Tilia Americana.

ARALIACEAE.

Acanthopanax ricinoides.
Aralia canescens.
Japonica.
spinosa.

CORNACEAE.

Cornus alternifolia.
Cornus florida.
Nyssa aquatica.

STYRACACEAE.

Mohrodendron Carolinum.
dipterum.

OLEACEAE.

Fraxinus Americana.
Bungeana.
excelsior.
lanceolata.
lutea.
Mandshurica.
Pennsylvanica.
quadrangulata.

SCROPHULARIACEAE.

Paulownia tomentosa.

BIGNONIACEAE.

Catalpa Bungei.
Catalpa.
Kaempferi.
speciosa.

CAPRIFOLIACEAE.

Viburnum Lentago.
prunifolium.

E. NURSERIES AND ORDERS.

Species not represented in other plantations.

PINACEAE.

Abies subalpina.
Chamaecyparis pisifera.
Cryptomeria Japonica.
Cupressus Benthami.
Juniperus communis alpina.
Dahurica.
Suecica.
Virginiana.
glauca.
Larix Dahurica.
Sibirica Archangelica.
Picea Engelmanni.
pungens glauca.
Pinus flexilis.
Murrayana.
ponderosa scopulorum.
Pseudotsuga taxifolia.
pendula.
Taxodium distichum.

AMARYLLIDACEAE.*

Narcissus Backhousei Wm. Wilks.
Barrii conspicuus.
Flora Wilson.
Orpheus.
bicolor compressa.
grandis.
Horsfieldii.
Burbidgei.
John Bain.
Ellen Barr.
Carbularia, large sulphur yellow ex. large.
snow white ex. strong.

*Collection presented by Mr. Peter Barr.

Narcissus cernuus.
cyclamineus major.
Golden Spur.
gracilis.
Humei Hume's Giant.
incomparabilis Autocrat.
Cynosure.
dble. albus plenus auranteus.
dble. albus plenus sulphureus.
dble. auranteus plenus.
Frank Miles.
Gwyther.
King of the Netherlands.
Poiteau.
Queen Bess.
semipartitus.
Sir Watkin.
Johnstonii Queen of Spain, 1st size.
Leedsii.
amabilis.
Minnie Hume.
Mrs. Langtry.
maximus.
minimus.
minor (true).
Nelsoni major.
obvallaris ex. large.
odorus rugulosus.
poeticus of Linnaeus.
ornatus, ex. large.
poetarum, ex. large.
P. B. Barr.
princeps, ex. large.
Santa Maria.
Scoticus, ex. large.
tortuosus.
triandrus albus, large size.
Wm. Goldring.
W. P. Milne.

SALICACEAE.

Populus balsamifera candicans.
Catharinae.
fastigiata.
laurifolia.
monilifera.
Moskoviensis.
Populus Simonii.
tremuloides.
Wobsti.
Salix alba vitellina.
amygdalina Trevoriana.
amygdaloides.
Ansoniana.
Babylonica.
Bashfordiana.
cotinifolia.
sericea.
viminalis regalia.

JUGLANDACEAE.

Hicoria laciniosa.
Pecan.

BETULACEAE.

Betula alba.
Carpinus Betulus.
Corylus rostrata.
Ostrya Virginiana.

FAGACEAE.

Alnus incanus virescens.
Castanea vesca.
Fagus sylvatica.
Quercus glandulifera.
grosse-serrata.
Mongolica.
nigra.
obtusiloba.
prinoides.
Prinos.

ULMACEAE.

Ulmus Sibirica.
Sinensis.
Zelkova Richardi.

MORACEAE.

Humulus Lupulus.
Morus alba.
Japonica.

POLYGONACEAE.

Atraphaxis lanceolata.

NYMPHAEACEAE.

Castalia alba.
candidissima.
helvola.
Marliac albida.
carnea.

Castalia Marliac chromatella.
rosea.
odorata gigantea.
maxima.
minor.
rosea.
sulphurea.
pygmaea.
Richardsoni.
tuberosa rosea.
Nelumbo lutea.
Nelumbo.

RANUNCULACEAE.

Atragene alpina Sibirica.
Clematis Davidiana.
ligusticifolia.
paniculata.
Paeonia* anomala.
insignis.
Peter Barr.
intermedia.
arietina.
Andersoni.
Boxteri.
Cretica.
Diogenes.
excelsior.
Matador.
Northern Glory.
Penelope.
Purple Emperor.
Rosy Gem.
atrorubens plena.
Bakeri.
Broteri.
corallina.
coriacea.
decora Gertrude.
Ianthe.
of Monte Gear.
humilis.
microcarpa.
officinalis alba fl. pl.
anemoneiflora.
rosea plena.
rubra plena.
Paeonia officinalis Otto Froebel.
rosea.
plena.
rubra plena.
Sabini.
paradoxa.
fimbriata.
peregrina.
Blushing Maid.
Brilliant.
Byzantina.
compacta.
Exquisite.
Ruby Queen.
pubens.
Russi of Sicily.
tenuifolia fl. pl.
hybrida.
triternata.

BERBERIDACEAE.

Akebia quinata.
Berberis Aquifolium.
Murreyana.
aristata floribunda.
heteropoda.
repens.
rhamnifolia.
spathulata.

MENISPERMACEAE.

Menispermum Canadense lobatum.
Dahurica.

MAGNOLIACEAE.

Magnolia Fraseri.
macrophylla.
Virginiana.

CALYCANTHACEAE.

Butneria florida.
occidentalis.

SAXIFRAGACEAE.

Deutzia scabra.
Hydrangea vestita.

GROSSULARIACEAE.

Ribes cereum.
divaricatum.
floridum var.

* Collection presented by Mr. Peter Barr.

Ribes nigrum.
robustum.
rubrum Brusskonaja.
sanguineum atrorubens.
var.
saxatile.

PLATANACEAE.

Platanus orientalis.

ROSACEAE.

Cercocarpus parvifolius.
Exochorda Alberti.
Holodiscus discolor.
Kerria Japonica.
Opulaster monogyna.
Rosa acicularis.
alpina.
Arkansana.
Beggeriana.
Schrenki.
Fendleri.
hispida.
involuta Wilsoni.
lucida.
lutea.
micrantha.
microphylla.
mollis.
nitida.
pisocarpa.
pomifera.
rugosa alba.
fl. pl.
sericea.
setigera.
spinosissima.
Altaica.
stylosa.
tomentosa.
Wichuraiana.
Rubus caesius.
corylifolius.
dumetorum.
echinatus.
fruticosus.
fuscus.
Hystrix.
laciniatus.
Rubus leucostachys.
Lindleyanus.
longithyrsiger.
macrophyllus.
mucronatus.
mutabilis.
neglectus.
pubescens.
radiatus.
scaber.
strigosus.
xanthocarpus.
Spiraea Billardii.
chamaedrifolia.
laevigata.
longigemmis.
Regeliana.
trilobata.

POMACEAE.

Amelanchier Canadensis.
Cotoneaster acutiloba.
frigida.
Simonsii.
vacillare (?) floribunda.
Crataegus chlorosarca.
nigrica.
Oxyacantha.
pinnatifida.
sanguinea.
Sinaica.
Malus coronaria.
Malus var.
Photinia villosa.
Pyrus baccata.
betulifolia.
intermedia.
Japonica.
nivalis.
Parkmanni.
Sorbus Americana.
Aucuparia.

DRUPACEAE.

Amygdalus nana.
Prunus acida.
Allegheniensis.
Armeniaca.
Avium multiplex.

Prunus Baldshuanica.
Chamaecerasus.
Japonica.
Laurocerasus Colchica.
Maackii.
nigra.
Pennsylvanica.
Persica.
Pseudo cerasus.
spinosa.

CAESALPINACEAE.

Cercis Siliquastrum.
Gleditsia Sinensis.
Gymnocladus dioica.

PAPILIONACEAE.

Caragana arborescens Redowski.
frutescens.
jubata.
microphylla.
pygmaea.
aurantiaca.
Cladrastis Amurensis var.
lutea.
Colutea arborescens purpureus.
cruenta.
Cytisus albus.
biflorus.
capitatus.
Laburnum.
nigricans.
purpureus.
scoparius.
Andreanus.
pendulus.
sessilifolius.
villosus.
Genista AEthnensis.
Anglica.
Germanica.
scoparia.
tinctoria elatior.
virgata.
Kraunhia Sinensis.
Laburnum alpinum.
biforme.
Robinia viscosa.
Ulex Europaeus.

OXALIDACEAE.

Oxalis Valdiviensis.

BUXACEAE.

Buxus sempervirens.
Pachysandra terminalis.

CORIARIACEAE.

Coriaria Japonica.

ANACARDIACEAE.

Rhus trilobata.

CELASTRACEAE.

Celastrus articulatus.
paniculatus.
scandens.
Euonymus Maackii.

ACERACEAE.

Acer campestre collinum.
glabrum.
laetum.
monspessulanum.
obtusatum.
platanoides.
spicatum.
Tataricum.
trilobatum.

HIPPOCASTANACEAE.

AEsculus flava.
glabra.
Hippocastanum.
Lyoni.

SAPINDACEAE.

Koelreuteria paniculata.

RHAMNACEAE.

Ceanothus Fendleri.
ovatus.
velutinus.
Hovenia dulcis.
Rhamnus Alaternus angustifolia.
infectoria.
tinctoria.

VITACEAE.

Parthenocissus Veitchii.
vitacea.
Vitus riparia.

TILIACEAE.

Tilia Americana.
cordata Japonica.

Tilia Europaea.
Mandshurica.
platyphylla.

THEACEAE.

Actinidia Kolomikta.
polygama.

CISTACEAE.

Helianthemum Apenninum.
roseum.

THYMELEACEAE.

Daphne Mezereum.

ELAEAGNACEAE.

Elaeagnus edulis.
Hippophae rhamnoides.
Lepargyraea Canadensis.

ARALIACEAE.

Panax sessiliflorum.

UMBELLIFERAE.

Krubera leptophylla.

CORNACEAE.

Cornus sanguinea (variegated).
Sibirica.

ERICACEAE.

Arctostaphylos Uva-ursi.
Azalea amoena.
arborescens.
lutea.
mollis.
viscosa.
Kalmia angustifolia.
glauca.
Leucothoë racemosa.
recurva.
Oxydendrum arboreum.
Rhododendron Catawbiense.
parviflorum.
punctatum.
Vaseyi.
Xolisma ligustrina.

VACCINIACEAE.

Gaylussacia resinosa.
Vaccinium corymbosum.
stamineum.

EBENACEAE.

Diospyros Virginiana.

STYRACACEAE.

Mohrodendron corymbosa.

OLEACEAE.

Forsythia Fortuni.
Fraxinus Americana.
auculaefolia.
Oregona.
Ornus.
Pennsylvanica.
platycarpa.
Syringa Emodi.
Japonica.
ligustrina.
Persica.
villosa.
vulgaris alba.
Count de Choisie.
hyacinthiflora.

LOGANIACEAE.

Buddleia curvifolia.
intermedia.
Lindleyana.

VERBENACEAE.

Callicarpa purpurea.
Vitex Agnus-castrex.

SOLANACEAE.

Lycium Chinense.

SCROPHULARIACEAE.

Paulownia tomentosa.

BIGNONIACEAE.

Tecoma grandiflora.
radicans praecox.

PEDALIACEAE.

Sesamum Indicum.

CAPRIFOLIACEAE.

Diervilla Japonica.
Middendorfiana.
sessilifolia splendens.
Leycesteria formosa.
Linnaea borealis.
Lonicera brachypoda.
chrysantha.
ciliata.
coerulea.
dependens.
flava.

Lonicera hispida.
involucrata.
Maacki.
Maximowiczii
Ruprechtiana.
Sibirica.
Tatarica.
Sambucus Canadensis.
laciniatus.
Sambucus nigra.
racemosa.
Symphoricarpos occidentalis.
Viburnum dilatatum.
Opulus nanum.
Oxycoccos.
Weigela amabilis.
Desboisii.
floribunda.

F. TEMPORARY GREENHOUSE.

CYATHEACEAE.

Alsophila australis.
Dicksonia Barometz.
dissecta.

POLYPODIACEAE.

Adiantum hastatum.
hispidulum.
pubescens.
Cyrtomium falcatum.
Doodia caudata.
Dryopteris Nevadensis.
mollis.
Nephrolepis cordata compacta.
exaltata.
Pellaea hastata.
Platycerium AEthiopicum.
alcicorne.
biforme.
Polypodium aureum.
Polystichum angulare.
Pteris cretica.
ensiformis.
hastata.
longifolia.
serrulata.
cristata.
tremula.
Woodwardia radicans.

SCHIZEACEAE.

Lygodium scandens.

SELAGINELLACEAE.

Selaginella caesia.
flabellata.
Emillana.

CYCADACEAE.

Cycas circinalis.
Cycas revoluta.
Zamia integrifolia.

PINACEAE.

Thuja gigantea.
Picea Sitchensis.
Abies grandis.
nobilis.
Pseudotsuga taxifolia.
Pinus Lambertiana.
Sabiniana.

GRAMINEAE.

Panicum excurrens.

CYPERACEAE.

Cyperus alternifolius.
var.
gracilis.
stricta.

PALMACEAE.

Areca lutescens.
Chamaerops excelsa.
Cocos Weddelliana.
Kentia Balmoriana.
Latania Borbonica.
Phoenix reclinata.
Sabal Blackburnianum.
Palmetto.
Neo washingtonia filifera.

ARACEAE.

Aglaonema marmorata.
Alocasia illustris.
sp.
Anthurium Schierzerianum.
sp.
sp.
sp.

Dieffenbachia Bausei.
Schismatoglottis Robelini.

BROMELIACEAE.

Billbergia sp.
Nidularium roseum.
Tillandsia sp.

PONTEDERIACEAE.

Piaropus crassipes.

LILIACEAE.

Aloe fruticosa.
grandiflora.
Hanburyana.
mitriformis.
picta.
Salmiana.
subalterna ?
succotrina.
sp. Mexico.
sp. Texas.
Anthericum variegatum.
Asparagus procumbens.
tenuissimus.
Dracaena Lindeni.
Gasteria sp.
sp.
Haworthia cymbiformis.
Sansevieria cylindrica.
gracilis.
zebrina.
Yucca sp.
sp.

AMARYLLIDACEAE.

Agave Americana.
variegata.
maculata.
planifolia.
rigida.
sp. Mexico.
sp.
sp.
Amaryllis sp. Madeira.
Crinum sp.
Doryanthes excelsa.
Eucharis Amazonica.
Fourcroya variegata.

MUSACEAE.

Musa Cavendishii.
Musa sapientum.
Strelitzia gigantea.
Reginae.

ZINZIBERACEAE.

Alpinia sp.
Elettaria Cardamomum.
Hedychium sp.

MARANTACEAE.

Maranta pumila.
rosea striata.
Wiota.
sp.
Thalia divaricata.

ORCHIDACEAE.

AErides sp.
Brassia Gireoudiana.
verrucosa grandiflora.
Calanthe furcata.
Cattleya amethystina glossa.
Bowringiana.
bicolor.
crispa.
Gaskelliana.
Harrisoniae violacea.
intermedia.
labiata Warnerii.
Leopoldii.
luteola.
Percivaliana.
Schofieldiana.
speciosissima.
velutina.
Coelogyne barbata.
corrugata.
cristata.
citrina.
major.
maxima.
flaccida.
latifolia.
Massangeana.
tomentosa.
sp.
Cymbidium atropurpureum.
Cypripedium albanense.
Ashburtoniae.
barbatum.

Cypripedium barbatum biflorum.
Boxallii.
callosum.
caudatum.
concolor Reginae.
Crossianum.
Dayanum.
Dominianum.
grande atratum.
Harrisianum.
Haynaldianum.
hirsutissimum.
insigne.
albomarginatum.
Io.
Leeanum.
longifolium.
Lowei.
Manlei.
Niobe.
nitens.
niveum.
Roebelenii.
Schlimi albiflorum.
Sedeni.
candidulum.
selligerum.
Spicerianum.
Stonei.
venustum.
sp.
Dendrobium aggregatum.
Ainsworthii.
Brymerianum.
capillipes.
Dayanum.
Dearei. ?
glumaceum.
filiforme.
haemoglossum.
heterocarpum.
Japonicum.
Jenkinsii.
Kingianum.
Leechianum.
Lindleyanum.
Lowii.
macrophyllum giganteum.
Dendrobium moniliforme.
nobile.
Parishii.
primulinum.
pulchellum.
suavissimum.
tortile roseum.
Veitchianum.
Wardianum.
sp.
Epidendron bicornutum.
nemorale majus.
sp.
Laelia anceps.
elegans.
Gouldiana.
grandis.
purpurata.
Lycaste aromatica.
Skinneri.
Miltonia Clowesii.
Moreliana.
sp.
Oncidium Papilio.
phymatochilum.
splendidum.
Phajus grandiflorus.
sp.
Pleione sp.
Trichosma suavis.
Zygopetalum Maackii.

MORACEAE.

Ficus altissima.
elastica.
repens.

POLYGONACEAE.

Coccoloba platyclada.

NYCTAGINACEAE.

Bougainvillea glabra Sanderiana.

AIZOACEAE.

Mesembryanthemum cordifolium.
tigrinum.

CRASSULACEAE.

Crassula lactea.
perfossa. ?
Echeveria Californica.
Peacockii.

Rochea falcata.
sp.
Sedum aureum.
ternatum.
sp.
sp.

MIMOSACEAE.

Acacia Farnesiana.

CAESALPINACEAE.

Cassia occidentalis.
Tora.

PAPILIONACEAE.

Clitoria ternata.
Erythrina crista-galli.
Galactia volubilis.
Hedysarum gyrans.
Rhynchosia erectus.
sp.

GERANIACEAE.

Pelargonium sp.

OXALIDACEAE.

Oxalis Ortgiesi.
sp. Mexico.
sp.

RUTACEAE.

Murraya exotica.

EUPHORBIACEAE.

Euphorbia Candelabrum.
cirrhiformis.
coerulescens.
grandicornis.
grandidens.
picta.
Granti.
Havenensis.
hermantiana.
lactea.
nerifolia.
polygona.
serpentina.
splendens.
Williamsi.

SAPINDACEAE.

Cardiospermum microcarpon.

MALVACEAE.

Abutilon "Africain."
Abutilon pedunculare.
"Souv. de Bonn."
sp.
Hibiscus aurantiacus.
chrysanthus.
Cooperi.
violaceus.
sp.
Pavonia Wioti.
Sida carpinifolia.
rhombifolia. ?

STERCULIACEAE.

Cola acuminata.
Mahernia odorata.

PASSIFLORACEAE.

Passiflora incarnata.
sp. Mexico.

BEGONIACEAE.

Begonia Credneri.
discolor.
glaucophylla scandens.
hydrocotylifolia.
"Louise Curtis."
manicata.
Rex.
Saundersii.
sp.
sp.

CACTACEAE.

Cactus Bonplandii.
Bridgesii.
colubrinus.
flavispinus.
gemmatus.
variabilis.
sp.
sp.
Cereus Baumani.
caesius.
candicans.
colubrinus.
De Regel.
flagelliformis.
grandiflorus.
Hamiltoni.
Jamacaru.
× grandiflorus

Cereus lateritus.
leptophus.
MacDonaldae.
macrogonus.
Maynardi.
McDonaldii.
nycticaulis.
Olfersii.
Peruvianus.
repandus.
rostratus.
serpentinus.
speciosissimus.
splendens.
tortuosus.
sp. Mexico.
sp. Mexico.
sp. Arizona.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
(Snake Cactus).
Echinocactus alcicornis.
Berlandieri.
brevihamatus.
caespitosus.
capricornus.
gonacanthus.
Grusoni.
LeContei.
longchanin.
maritimus.
multicostatus.
ornatus Mirobelli.
pectinatus.
pilosus.
Roemeri.
Texensis.
viridescens.
sp. Texas.
sp. Texas.

Echinocactus sp.
sp.
sp.
Echinopsis multiplex.
Zuccarinii.
Epiphyllum truncatum.
violaceum.
sp.
sp.
sp.
Mammillaria applanata.
arietina.
cirrhifera longispina.
elegans.
lasiacantha.
micromeris.
minima.
nivea.
pusilla.
Stella-aurata.
sp.
Opuntia basilaris.
brachyantha.
Brasiliensis.
crinifera.
cylindrica.
dulcis.
Emoryi.
Engelmanni.
occidentalis.
Ficus-Indica.
frutescens.
fulgida.
Greggii.
Kleiniae.
leucotricha.
microdasys.
rubida.
nigricans.
polyacantha.
prolifera.
rufescens.
rutila.
serpentina.
Tuna.
sp. Mexico.
sp. Mexico.
No. 1.

Opuntia No. 2. Arizona.
No. 3. Arizona.
No. 5. California.
No. 6.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
Pereskia Bleo.
sp.
Phyllocactus Ackermanni.
albus superbus.
anguliger.
crenatus.
Feasti.
Hookeri.
Jenkinsonii.
latifrons.
roseus superbus.
speciosus.
superbus.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
Pilocereus fossulatus.
senilis.
Rhipsalis Cassytha.
crispa.
mesembryanthemoides.
pachyptera.
paradoxa.
salicornioides.
triquetrum.

LYTHRACEAE.

Lagerstroemia Indica.
rosea.
Punica sp.

MYRTACEAE.

Eugenia Ugui.
sp.
Psidium lucidum.
sp.

MELASTOMACEAE.

Heeria rosea.
Pleroma elegans. ?

ONAGRACEAE.

Fuchsia " Beauty's Bloom."
"Chas. Blanc."
"Dolly Varden."
" Flacon de Neige."
"Inimitable."
"Little Beauty."
"Mammoth Purple."
"Mrs. John Taylor."
"Oriflamme."
"Phenomenal."
speciosa.
" Storm King."
"Trailing Queen."
triphylla.
"Wave of Life."
"White Phenomenal."

ARALIACEAE.

Panax Victoriae.

PRIMULACEAE.

Cyclamen Europaeum ?
Primula Forbesii.

LOGANIACEAE.

Gelsemium sempervirens.

APOCYNACEAE.

Mandevilla suaveolens.
Toxicophlaea spectabilis.
Trachelospermum jasminoides.

ASCLEPIADACEAE.

Stapelia atrata.
grandiflora.
multiflora.
muricata.
mutabilis.
Natalensis.
parviflora.
picta.

Stapelia purpurea.
scutellata.
variegata.
sp.
sp.

CONVOLVULACEAE.

Convolvulus Mauritanicus.

VERBENACEAE.

Verbena ?

SOLANACEAE.

Cestrum Parqui ?
Solanum Wendlandii.

SCROPHULARIACEAE.

Russelia juncea.
Veronica imperialis.

GESNERIACEAE.

Cyrtodeira metallica.
Saintpaulia ionantha.
Streptocarpus Wendlandi.

ACANTHACEAE.

Fittonia argyroneura.

RUBIACEAE.

Rondeletia speciosa.

COMPOSITAE.

Chrysanthemum inodorum plenissimum.
Eupatorium capillifolium.
sp. Florida.
Kleinia articulata.
sp.
Senecio sp. Mexico.
Solidago stricta.
Stevia serrata.

REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND ANNUAL MEMBERS.

(*Submitted and Accepted January 9, 1899.*)

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen:

At the annual meeting of January 10, 1898, we reported that the total annual membership to date was 544
The number that have since qualified is 115

Making a total of 659
The number of annual members deceased and resigned during the year is 22

The total annual membership to date being 637

Annual dues for 1897 and 1898 have been collected to the amount of $6,180, which has been transmitted to the Treasurer as received.

The number of members in arrears for annual dues for 1898 is 16.

The number of members in arrears for annual dues for 1897 and 1898 is 6.

Two persons have qualified as Fellows by the payment of $1,000 each, and two as life members by the payment of $100 each. These sums have been transmitted to the Treasurer for credit to the Endowment Fund.

A complete list of annual members to date is herewith submitted.

Robert Abbe, M.D.,
Edward D. Adams,
A. G. Agnew,
Mrs. Cornelius R. Agnew,
John T. Agnew,
Richard H. Allen,
Wm. C. Alpers,
Bernard G. Amend,
G. Amsinck,
J. M. Andreini,
John D. Archbold,
Edmund S. F. Arnold, M.D.,
Reginald H. Arnold,
John W. Auchincloss,

George C. Austin,
Samuel P. Avery,
Samuel P. Avery, Jr.,
Frederic Baker,
Geo. V. N. Baldwin,
Robert F. Ballantine,
Ewald Balthasar,
Amzi Lorenzo Barber,
E. W. Barnes,
John S. Barnes,
Chas. T. Barney,
John Hendley Barnhart,
William Barr,
Wm. R. Barr,
E. W. Bass,
Thos. H. Bauchle,
Chas. C. Beaman,
Gerard Beekman,
M. H. Beers,
Staats S. Bell,
August Belmont,
Geo. H. Bend,
James H. Benedict,
Mrs. Adolph Bernheimer,
Chas. L. Bernheimer,
Simon Bernheimer,
Simon E. Bernheimer,
Edward J. Berwind,
Henry Beste,
Francesco Bianchi,
Eugene P. Bicknell,
L. Horatio Biglow,
Isaac Bijur,
Miss Elizabeth Billings,
Geo. Blagden,
Mrs. Birdseye Blakeman,
Louis H. Blakeman,
Mrs. S. A. Blatchford,
Geo. T. Bliss,
Lyman G. Bloomingdale,

Frank S. Bond,
Hon. H. W. Bookstaver,
Geo. S. Bowdoin,
John M. Bowers,
Michael Brennan,
M. P. Breslin,
Mrs. Benjamin Brewster,
Marvin Briggs,
Chas. Astor Bristed,
Jno. I. D. Bristol,
W. F. Brittain,
Mrs. Harriet Lord Britton,
Frederic Bronson,
Mrs. Kate M. Brookfield,
John Crosby Brown,
Robert I. Brown,
W. L. Brown,
H. B. Brundrett,
William Bryce, Jr.,
W. Buchanan,
Albert Buchman,
James Buckhout,
Wm. Allen Butler,
John Cabot, M.D.,
George Calder,
Emil Calman,
Henry L. Calman,
Henry L. Cammann,
Mrs. Miles B. Carpenter,
James C. Carter,
John W. Castree,
John H. Caswell,
Frank R. Chambers,
Chester W. Chapin,
Geo. E. Chisolm,
Mrs. Wm. E. Chisolm,
Jared Chittenden,
W. F. Chrystie,
E. Dwight Church,
John K. Cilley,

John Claflin,
Wm. N. Clark,
C. C. Clarke,
Banyer Clarkson,
Frederick Clarkson,
Wm. J. Coates, M.D.,
Wm. F. Cochran,
John W. Cochrane,
Miss Mary T. Cockcroft,
C. A. Coffin,
Chas. H. Coffin,
Edmund Coffin,
E. W. Coggeshall,
Samuel M. Cohen,
N. A. Colburn,
F. Collingwood,
Miss Ellen Collins,
Mrs. Wm. Combe,
Alexander T. Compton,
E. C. Converse,
Wm. L. Conyngham,
C. T. Cook,
Mrs. C. T. Cook,
Edward Cooper,
Geo. Coppell,
C. H. Coster,
Chas. J. Coulter,
Albert Crane,
Francis Crawford,
Robert L. Crawford,
John D. Crimmins,
Frederic Cromwell,
Edwin A. Cruikshank,
Chas. Curie,
Chas. B. Curtis,
Geo. H. Daniels,
Ira Davenport,
Wm. Gilbert Davies,
H. de Coppet,
Richard Deeves,
Robert W. DeForest,
Miss Julia L. Delafield,
Maturin L. Delafield, Jr.,
Charles de Rham,
Theo. L. De Vinne,
W. B. Dickerman,
Chas. D. Dickey,
Mrs. Hugh T. Dickey,
Geo. H. Diehl,
Chas. F. Dieterich,
Miss Mary A. Dill,
Mrs. Henry F. Dimock,
Morgan Dix,
Cleveland H. Dodge,
Miss Grace H. Dodge,
Mrs. Wm. E. Dodge,
Mrs. Wm. E. Dodge, Jr.,
C. W. Doherty,
L. F. Dommerich,
Mrs. Henry Dormitzer,
John J. Drake,
Miss Katherine Du Bois,
Matthew B. Du Bois,
Wm. A. Du Bois,
John P. Duncan,
Edward K. Dunham,
George H. Dunham,
H. A. Du Pont,
John S. Durand,
Thomas Dwyer,
Dorman B. Eaton,
Newbold Edgar,
Jarvis B. Edson,
Mrs. Jonathan Edwards,
August Eimer,
David L. Einstein,
Mrs. Matilda A. Elder,
Geo. W. Ellis,
John W. Ellis,
Wm. W. Ellsworth,

John J. Emery,
Louis Ettlinger,
E. Eyre,
H. C. Fahnestock,
Thos. H. Faile,
Samuel W. Fairchild,
James C. Fargo,
B. Fischer,
Mrs. Josiah M. Fiske,
Mrs. Louis Fitzgerald,
Wm. L. Flanagan,
Miss Helena Flint,
A. R. Flower,
J. D. Flower,
Col. DeLancey Floyd-Jones,
James B. Ford,
Edw. W. Foster,
Mrs. A. Frankfield,
Joel Francis Freeman,
Joseph E. Gay,
S. J. Geoghegan,
John J. Gibbons,
Mrs. Theodore Kane Gibbs,
R. W. Gibson,
Peter C. Gillings,
Chas. J. Gillis,
Frederic N. Goddard,
W. N. Goddard,
Chas. H. Godfrey,
Mrs. Edwin L. Godkin,
Frederic Goodridge,
Mrs. Frederic Goodridge,
Francis Goodwin,
James J. Goodwin,
Miss Theodora Gordon,
Hon. Wm. R. Grace,
Malcolm Graham,
Henry Graves,
Ernest F. Greeff,
John Greenough,
Isaac J. Greenwood,
Rev. David H. Greer,
Chester Griswold,
J. B. M. Grosvenor,
W. C. Gulliver,
Bernard G. Gunther,
W. S. Gurnee,
W. S. Gurnee, Jr.,
John A. Hadden,
J. & M. Haffen,
James D. Hague,
Frederic R. Halsey,
Miss Laura P. Halsted,
Chas. T. Harbeck,
J. Montgomery Hare,
S. W. Harriot,
Marcellus Hartley,
Jacob Hasslacher,
Thos. S. Hastings,
Louis Haupt, M.D.,
G. G. Haven,
Edwin Hawley,
R. Somers Hayes,
J. Waldemar Hayward,
Arthur H. Hearn,
John G. Heckscher,
Homer Heminway,
Chas. R. Henderson,
Jos. J. Henderson,
Edmund Hendricks,
Samuel Henshaw,
Hon. Abram S. Hewitt,
Geo. R. Hill,
James K. Hill,
Wm. K. Hinman,
John H. Hinton, M.D.,
Abbott Hodgman,
Very Rev. E. A. Hoffman,
E. B. Holden,
E. R. Holden,

Henry Holt,
Isaac A. Hopper,
Burrett W. Horton,
G. H. Houghton,
Lucius W. How, M.D.,
Alfred M. Hoyt,
Samuel N. Hoyt,
Gen. Thos. H. Hubbard,
John E. Hudson,
Theodore D. Hurlbut,
Frank Hustace,
William Hustace,
Clarence M. Hyde,
Henry Iden, Jr.,
John B. Ireland,
Mrs. Adrian Iselin,
Adrian Iselin, Jr.,
Theo. F. Jackson,
A. Jacobi,
Robert Jaffray,
A. C. James,
D. Willis James,
Robert C. James, M.D.,
E. G. Janeway,
Samuel M. Jarvis,
O. G. Jennings,
Walter Jennings,
James R. Jesup,
Geo. Pryor Johnson,
Adrian H. Joline,
Mrs. John D. Jones,
Walter R. T. Jones,
S. Nicholson Kane,
Mrs. H. F. Kean,
Mrs. A. B. Kellogg,
Mrs. Chas. Kellogg,
Mrs. Eugene Kelly,
Thos. H. Kelly,
Edward Kemp,
J. F. Kemp,
H. Van Rensselaer Kennedy,
Mrs. Elizabeth C. Kenyon,
Mrs. Catherine L. Kernochan,
Geo. A. Kessler,
Wm. Kevan,
David H. King, Jr.,
William F. King,
Gustave E. Kissel,
Herman Knapp,
Percival Knauth,
Henry C. F. Koch,
Chas. Kohlman,
Julius G. Kugelman,
Percival Kühne,
H. R. Kunhardt, Jr.,
W. B. Kunhardt,
Adolf Kuttroff,
Francis G. Landon,
Woodbury Langdon,
J. D. Lange,
Jesse Larrabee,
Mrs. Samuel Lawrence,
W. V. Lawrence,
J. D. Layng,
Emanuel Lehman,
Arthur L. Lesher,
Mrs. John V. B. Lewis,
W. H. Lewis, Jr.,
Philip Lewisohn,
Wm. S. Livingston,
Wm. C. Lobenstine,
James Loeb,
Walter S. Logan,
Mrs. Daniel D. Lord,
Franklin B. Lord,
R. P. Lounsbery,
August Lueder,
Walther Luttgen,
David Lydig,
Samuel H. Lyman,

Mrs. Alida McAlan,
C. W. McAlpin,
Geo. L. McAlpin,
John A. McCall,
J. Jennings McComb,
Mrs. W. H. McCord,
John A. McCreery, M.D.,
Thos. A. McIntyre,
D. E. MacKenzie,
Rev. Haslett McKim,
George William McLanahan,
Malcolm MacMartin,
Chas. A. Macy, Jr.,
Wm. H. Macy, Jr.,
J. H. Maghee,
Chas. Mallory,
Theophilus M. Marc,
Jacob Mark,
T. M. Markoe,
Chas. M. Marsh,
Chas. H. Marshall,
Louis Marshall,
Brander Matthews,
Robert Maxwell,
David Mayer,
Harry Mayer,
Theo. H. Mead,
Mrs. Emma Mehler,
Payson Merrill,
Henry Metcalfe,
J. Meyer,
Thos. C. Meyer,
S. M. Milliken,
A. G. Mills,
Roland G. Mitchell,
Peter Moller,
John Monks,
Alphonse Montant,
Francis C. Moore,
John G. Moore,
Wm. H. Helme Moore,
E. D. Morgan,
Geo. H. Morgan,
A. H. Morris,
A. Newbold Morris,
Henry Lewis Morris,
Geo. Austin Morrison,
Ed. M. Muller,
Robt. I. Murray,
Isaac Myer,
Nathl. Myers,
Adam Neidlinger,
Wm. Nelson,
Geo. G. Nevers,
Miss Catherine A. Newbold,
Miss Edith Newbold,
Frederic R. Newbold,
Geo. L. Nichols,
A. Lanfear Norrie,
Gordon Norrie,
Wm. H. Oakley,
Hon. James A. O'Gorman,
E. E. Olcott,
Robert Olyphant,
Mrs. Emerson Opdycke,
Adolphe Openhym,
Mrs. Wm. Openhym,
Henry F. Osborn,
Mrs. W. H. Osborn,
Lowell M. Palmer,
N. F. Palmer,
S. S. Palmer,
Cortlandt Parker,
John H. Parker,
Mrs. Phebe A. Parshall,
Charles Parsons,
John E. Parsons,
J. M. Patterson,
Geo. Foster Peabody,
Alfred Pell,

Wm. Hall Penfold,
Samuel T. Peters,
W. R. Peters,
Lloyd Phoenix,
Phillips Phoenix,
Winslow S. Pierce,
Gifford Pinchot,
Fred. S. Pinkus,
Gilbert M. Plympton,
Henry W. Poor,
De Veaux Powel,
Joseph M. Pray,
J. Dyneley Prince,
Chas. Pryer,
James Tolman Pyle,
M. Taylor Pyne,
Percy R. Pyne,
Jas. H. Quintard,
Gustav Ramsperger,
Geo. Curtis Rand,
Rastus S. Ransom,
Geo. R. Read,
Wm. A. Read,
G. H. Redmond,
Whitelaw Reid,
John B. Reynolds,
John Harsen Rhoades,
Chas. Rice, Ph.D.,
Auguste Richard,
P. de P. Ricketts,
Sam'l Riker,
Wm. C. Rives,
S. H. Robbins,
Miss Mary M. Roberts,
Andrew J. Robinson,
Frederick Rode,
J. C. Rodgers,
H. H. Rogers,
N. C. Rogers,
Theo. Rogers,

Clinton Roosevelt,
W. Emlen Roosevelt,
Elihu Root,
Jacob Rothschild,
Wm. Rothschild.
George P. Rowell,
Jacob Ruppert,
Mrs. A. D. Russell,
Chas. Howland Russell,
Clarence Sackett,
Henry W. Sackett,
L. F. Saumenicht,
Reginald H. Sayre,
Edward C. Schaefer,
Robt. W. Schedler,
Carl Schefer,
Robt. Schell,
J. Egmont Schermerhorn,
Wm. Jay Schieffelin,
Jacob H. Schiff,
Miss Jane E. Schmelzel,
Henry W. Schmidt,
Paul G. Schoeder,
S. L. Schoonmaker,
C. Schumacher,
B. W. Schwab,
Adolph Schwarzmann,
Wm. F. Sebert,
Mrs. Horace See,
George W. Seligman,
Isaac N. Seligman,
T. G. Sellew,
F. Seringhaus,
Mrs. Angelica B. Shea,
W. H. Sheehy,
Edward M. Sheppard,
G. K. Sheridan,
Gardiner Sherman,
G. O. Shields,
Robert Simon,

Mrs. Annie Morrill Smith,
Edward A. Smith,
John Jewell Smith,
James R. Smith,
Philip A. Smyth,
Hans Sommerhoff,
Chas. Sooysmith,
A. W. Soper,
Samuel Spencer,
Paul N. Spofford,
Edward Hamilton Squibb, M.D.,
J. R. Stanton,
Gustav E. Stechert,
James R. Steers,
Benjamin Stern,
Isaac Stern,
Louis Stern,
Francis L. Stetson,
Alexander H. Stevens,
Lispenard Stewart,
Wm. R. Stewart,
Jos. Stickney,
Miss Clara F. Stillman,
Miss C. Phelps Stokes,
James Stokes,
Mason A. Stone,
Sumner R. Stone,
George Storm,
Chas. Strauss,
Edward Sturges,
F. K. Sturgis,
Thos. Sturgis,
Mrs. Geo. Such,
John S. Sutphen,
Frederick G. Swan,
Albert Tag,
Edward N. Tailer,
Tozo Takayanagi,
C. A. Tatum,
Miss Alexandrina Taylor,
Peter B. Taylor,
Stevenson Taylor,
Wm. E. Tefft,
H. L. Terrell,
Ernest Thalmann,
Robert M. Thompson,
Walter Thompson,
Miss Phebe Anna Thorne,
William Thorne,
W. V. S. Thorne,
Albert Tilt,
E. Titus, Jr.,
J. Kennedy Tod,
William Toel,
Wm. Toothe,
R. H. L. Townsend,
R. W. Townsend,
C. D. Tows,
J. Evarts Tracy,
Miss Susan Travers,
Mrs. J. B. Trevor,
Alfred Tuckerman,
Paul Tuckerman,
Edward P. Tysen,
E. S. Ullmann,
Miss Anna Murray Vail,
Herbert Valentine,
Mrs. Lawson Valentine,
Cornelius Van Brunt,
Chas. H. Van Brunt,
E. H. Van Ingen,
Alfred Van Santvoord,
Edgar B. Van Winkle,
Miss Elizabeth S. Van Winkle,
Geo. H. Vose,
John Wagner,
Hon. Salem H. Wales,
Henry F. Walker,
Antony Wallach,
Wm. I. Walter,

E. A. Walton,
Wm. T. Wardwell,
Allan C. Washington,
John I. Waterbury,
Miss Emily A. Watson,
H. Walter Webb,
S. D. Webb,
W. H. Webb,
Geo. P. Webster,
Mrs. John A. Weekes,
Camille Weidenfeld,
R. E. Westcott,
George Westinghouse,
Jno. M. E. Wetmore, M.D.,
Geo. G. Wheelock, M.D.,
Wm. E. Wheelock, M.D.,
Horace White,
Stanford White,
J. Henry Whitehouse,
Wm. Wicke,
Edward A. Wickes,
Robert F. Wilkinson,
David Willcox,
Jno. T. Willets,
G. G. Williams,
Richard H. Williams,
Washington Wilson,
Wm. G. Wilson,
John D. Wing,
Egerton Winthrop,
Greenville L. Winthrop,
Robert Dudley Winthrop,
Mrs. Frank S. Witherbee,
Ernest G. W. Woerz,
A. Wolff,
Emil Wolff,
Mrs. Cynthia A. Wood,
John D. Wood,
John A. Woods,
F. F. Woodward,
R. S. Woodward,
W. H. Wolverton,
Henry H. Wotherspoon,
Miss Cornelia S. Wray,
C. S. Young,
Edw. L. Young,
Andrew C. Zabriskie,
O. F. Zollikoffer.

REPORT OF THE HONORARY CURATOR OF ECONOMIC COLLECTIONS.

To the Board of Scientific Directors,
New York Botanical Garden,

Gentlemen: I have the honor to submit herewith my report as Curator of the Economic Collections for the year of 1898.

Immediately after my appointment, the Director-in-Chief indicated his ideas for establishing this Department upon a more distinctly and systematically educational basis than is customary in institutions of the kind. This was, in brief, instead of confining the exhibits to a mere accumulation of economic products, to represent as far as possible the industries connected with their production and manufacture. In this way, the guide-book to the collections which will ultimately be published, may be in the nature of a compend of economic botany. Recognizing that the realization of this plan would be difficult and slow, it was understood that the ordinary accumulation of specimens should proceed at the same time. This arrangement involves the consideration of two more or less distinct divisions of the collections. For convenience and intelligibility, the former will be hereafter referred to as the "Industrial Collection," the latter as the "General Collection."

Four methods of obtaining exhibits were open to us, namely, purchase, collection, exchange and donation.

Any extensive accumulation by purchase was precluded by the fact that no adequate fund was available.

The same condition restricted acquisitions by collection chiefly to local products.

For exchange purposes we had very little material on hand, but experience had taught us that institutions having material to exchange would not be slow to supply it upon our promise to make future returns, provided we should announce a reasonably promising plan for doing so.

The amount of material to be obtained through donation was largely problematical, though we were informed of

sources from which very considerable acquisitions might be expected.

In accordance with these conditions, the following action has been taken along each of the lines specified.

Purchases were limited to two classes of cases. First, to agreeing to pay the necessary expenses of obtaining such exhibits as might be secured through the unpaid services of friends and correspondents. In this way we have secured from Dr. Charles Mohr, of Mobile, an industrial exhibit of the turpentine industry. We have also entered into an agreement with Professor P. H. Mell, of the Alabama Polytechnic Institute, Auburn, Alabama, to supply an industrial exhibit illustrating the production and marketing of cotton, and with Mr. W. G. Forster, of Aden, to supply exhibits of the Zante currant and date industries.

The other class of cases in which the purchase method was adopted was in case of special expeditions to otherwise inaccessible regions, when we would employ the opportunity of having economic products collected for us. In this way an arrangement was made with Mr. Herbert H. Smith to furnish us products from the Santa Marta region of the U. S. of Colombia, and with a Mr. Fairbanks, to collect certain rare products in the neighborhood of Pernambuco, Brazil.

The exchange method was regarded as of necessity our principal reliance for obtaining exhibits of a general character, and a special plan was devised, based upon the known eagerness of all institutions to secure material of absolutely authenticated origin, the greater portion of that ordinarily coming to hand lacking this element in some way. It was decided to secure all our material for exchange through special collection by persons having had sufficient botanical training, and to accompany each specimen of economic material with a herbarium specimen taken from the same plant or group of plants, and also by full records of the circumstances of collection. As no provision had yet been made for the continuous employment of a collector, the temporary services of Professor A. A. Tyler, of Syracuse University, were ob-

tained during his summer vacation, spent in the vicinity of Easton, Pa. Dr. Tyler was supplied with a complete list of the economic material accessible in this general region, with detailed instructions for the collection and preservation of each species, to the number of nearly three hundred. Dr. Tyler worked during the months of July and August and collected 20 sets of 83 species each. An offer to exchange these specimens was then embodied in a printed circular, copy of which accompanies this report, and designated " Circular No. 2." Exchanges have been arranged as follows:

The Instituto Medico Nacional, of Mexico, has promised us a duplicate set of their exhibits in course of preparation for the Paris Exposition.

The Technological Museum of Sidney has promised us a collection of Australian products.

Negotiations are now under way with the Government of British India for a complete set of the economic products of that country, and promise to result successfully.

Many copies of our circular have been mailed to distant institutions, which, owing to the late date when the circular was printed, have not resulted in the arrangement of exchanges up to the close of the year.

In the matter of securing donations, a special course was followed, in addition to the ordinary one of improving such casual opportunies as presented themselves. A list of all the leading vegetable-product industries, to the number of more than a hundred, was prepared, and a schedule made out of all the articles required to suitably illustrate each of them. Copies of these schedules were sent to representative persons or companies engaged in the respective industries. A special printed circular, designated " Circular No. 1," and copy of which accompanies this report, was prepared, setting forth the principles and methods of our proposed industrial exhibit, and inviting those able and willing to donate the required sets of materials, models, photographs and other articles listed in the respective schedules. The advantages likely to accrue to those making these donations were suitably

set forth. A copy of this circular was sent with each schedule, and each was also accompanied by a special letter. It was scarcely hoped that any great results would accrue immediately from this attempt, and so the result has proven; yet it can be stated that the exhibits already received and definitely promised fully repay all the expenses and trouble involved in the attempt. Your Curator is moreover convinced that the attempt will eventually result in a complete success. The expense and trouble involved in getting up such elaborate industrial exhibits as our circular contemplates is very considerable, and apt to deter many concerns, even though well-disposed toward our undertaking. When, however, a number of such exhibits shall have been placed in position, the plan will, I am convinced, so commend itself to others that they will be more than ready to become represented in it. It will be necessary for this object to be pressed unremittingly, one effort to be followed up by another, until such a measure of success shall have been attained as to become the means of itself advancing the undertaking. The results thus far attained in this direction are as follows:

Mr. Edward Kemp and his Smyrna agents, Messrs. Alfred A. Keun & Co., have presented a set of specimens, implements and photographs, illustrative of the opium industry in Turkey.

The Paddock & Fowler Co., of this city, have presented a set of photographs illustrative of fig-packing in Smyrna.

Arrangements have been made for the following additional exhibits:

Mr. Edward Kemp and his agent at Grasse, M. A. Chiris, have promised an exhibit of the perfume industry at Grasse.

Messrs. Gilpin, Langdon & Co., of Baltimore, have promised an exhibit illustrating the principles of the standardization of drugs on the basis of their percentage of active constituents.

Messrs. F. H. Leggett & Co., of this city, have partly promised exhibits illustrative of the olive and nutmeg industries.

Messrs. Fritzsche Bros., of Garfield, N. J., have promised an exhibit of the volatile oil industry.

With regard to the specimens already in our possession, little could be done except to keep them properly stored and labelled in anticipation of the preparation of our museum-building to receive them.

Arrangements have been made for the compilation of a complete check-list of useful plants and plant products, to serve as the basis for our plan of accumulation. The articles to be included have been classified according to their nature or uses, and the plants pertaining to each class will be arranged in botanical sequence. The preparation of so elaborate a list will prove a long and tedious task, but it is deemed wise to undertake it at the outset, rather than to waste time upon provisional lists which must after a time be abandoned, necessitating the rearrangement and renumbering of our exhibits.

In view of the fact that we must rely upon exchange methods for securing by far the larger portion of our exhibits, and as this is by far the simplest, most certain and most economical method which can be followed, it is hereby recommended that a permanent collector be employed.

Accounts of all expenditures for this department have been rendered to the Director-in-Chief, and copies of all correspondence have been filed.

Respectfully submitted,

H. H. Rusby,

Honorary Curator.

BOTANICAL CONTRIBUTIONS.

1. Description of a new Stonecrop from Mexico.

By N. L. Britton.

Sedum Mexicanum n. sp.

Herbaceous, succulent, very brittle, the flowering stems weak, becoming 1 dm. long; leaves linear, sessile, compressed, tapering to a blunt tip, scattered on the flowering stems, more crowded on the sterile shoots, 8–20 mm. long, about 2 mm. wide: inflorescence of 3 usually 2-forked recurving branches, 4–8 cm. long; flowers close together, sessile; bracts longer than the similar sepals; petals golden yellow, oblong, acute at the apex, concave, tapering into a short claw, widely spreading, 5–6 mm. long, 1.5 mm. wide, a little longer than the two outer sepals, twice as long as the three inner ones; filaments filiform, nearly as long as the petals; anthers short, oval; pistils as long as the stamens; style subulate, 1 mm. long.

Grown from seeds collected by Mrs. Britton on a trap dyke near the City of Mexico, November, 1896. Flowered in cool house May, 1898. Very showy in bloom. (Type specimen in Herbarium of the New York Botanical Garden.)

Cespitose Willows of Arctic America and the Rocky Mountains.

By P. A. Rydberg.

The five summers spent by me in the Rocky Mountain region have shown me how little was really known about the willows of that part of the country, and a collection of willows from British America, which Mr. James Macoun sent me in 1897, persuaded me that we know still less about the arctic and subarctic species of North America. The reason is probably to be found at least partly in the fact that we have relied on a single man's knowledge of the genus *Salix*, and sent all our material to him for determination without trying individually to investigate it. The late Mr. Bebb, of Fountaindale, Ill., was, I doubt not, well acquainted with the wil-

lows of the eastern United States, and especially with those species grown by him in his garden. Judging, however, from the way he has determined the willows of British America and the Rockies, in our herbaria, I do not think that I do him an injustice, if I say that he had not the very best conception of these species.* His conception of *S. anglorum* (*S. Brownii* Lundts., *S. arctica* R. Br., not Pall.) was, for example, so broad that nearly any cespitose willows with catkins borne on short leafy branches, brown or fuscous obovate bracts and tomentose capsules with an evident style were included under that species. Specimens of nine or ten of the forms treated as species below, have been named *S. arctica* R. Br., *S. Brownii*, *S. arctica* var. *petraea* or *S. Brownii* var. *petraea* by Mr. Bebb. But this is not the only species. *S. desertorum* and *S. reticulata*, as understood by him, consist, in my opinion, of at least three species each. I can easily understand the reason for Mr. Bebb's position in this respect. He was not acquainted with these species in their natural habitat, and belonged to the older class of botanists who did not admit as specific those characters, which must be taken in consideration in a genus such as *Salix*. If characters generally accepted as good by European salicologists should be applied to American species, I think that the number of our native species of willows would be doubled. I have here endeavored to apply them to the cespitose willows of Arctic America and the Rockies. The reasons for my publishing on the genus *Salix* are the following: 1. I have a knowledge of several of them from field study and had to work up some for an annotated catalogue of the flora of Montana, now in press. 2. I have at least a superficial knowledge of many from British America from the collections sent me by Professor Macoun. 3. I think that it will aid Professor Rowlee of Cornell University in his monographing of the willows, if he has the opinions of others on certain species.

* Professor John Macoun and his son and assistant, J. M. Macoun, have both expressed their dissatisfaction with the naming of the species in the Herbarium of the Geological Survey of Canada.

The work is based on specimens in the following herbaria: Columbia University, New York Botanical Garden, Geological Survey of Canada, Harvard University, Messrs. William M. Canby, Frank Tweedy, and my own.

To draw a line between the cespitose and fruticose willows is, of course, impossible. I have tried to confine myself to those that are usually less than half a meter high. There are several species from the Cascades and Sierra Nevada that might have been included here, but as my knowledge of these is so limited, I have omitted them.

The arctic or alpine willows may be grouped as follows:

Capsule more or less densely tomentose or villous.
  Style almost none. — RETICULATAE.
  Style evident. — ARCTICAE.
Capsule glabrous or nearly so.
  Leaf margin entire.
    Leaves 1–2 cm. long; catkins many-flowered; style generally evident, but short. — OVALIFOLIAE.
    Leaves less than 5 mm. long; catkins few- (in ours 2–4-) flowered; style almost none. — RETUSAE.
  Leaves serrate or dentate. — HERBACEAE.

RETICULATAE.

Densely cespitose arctic or alpine willows with mostly prostrate branches and less than 1 dm. high (except *S. vestita*); leaves rather thick and more or less reticulate (except *S. glacialis*); ovary more or less tomentose, with a sessile twice 2-cleft stigma.

Leaves covered beneath with long white silky hairs. — 1. *S. vestita*.
Leaves at least in age not silky beneath.
  Leaf-blade over 1 cm. long.
    Lower portion of filaments very hairy; leaves strongly reticulate.
      Bracts broadly obovate, fuscous, almost glabrous, at least the upper portion. — 2. *S. orbicularis*.
      Bracts oblong, yellow, densely hairy. — 3. *S. reticulata*.
    Filaments almost glabrous; leaves less strongly reticulate; bracts cuneate-oblong, yellow, almost glabrous. — 4. *S. saximontana*.
  Leaf-blade 1 cm. long or less.
    Catkins few-flowered, less than 1 cm. long; leaves strongly reticulate; bracts yellow, almost glabrous. — 5. *S. nivalis*.
    Catkins many-flowered, 1–3 cm. long; leaves thin, not reticulate; bracts fuscous, hairy. — 6. *S. glacialis*.

1. SALIX VESTITA Pursh, Fl. Am. Sept. 610.

This species differs from the others not only by the presence of the long silky hairs on the lower surface of the leaves, but also by the fact that it often forms a shrub several decimeters high. Its range extends from Labrador to the Rocky Mountains.

LABRADOR: *Butler*; 1892, *A. C. Waghorne, nos. 2* and *3*, 1893.

LOWER CANADA: Table Top Mountain, 1881, *J. A. Allen.*

CANADIAN ROCKY MOUNTAINS: *Drummond; Herb. Hooker, Barratt & Torrey, nos. 83 & 84.*

MONTANA: Old Marias Pass, *Sargent & Canby;* 1883, *Canby, no. 292;* McDonald's Peak, *no. 291.*

2. SALIX ORBICULARIS Anders. DC. Prod. **16**[2]: 300.

Most specimens labeled *Salix reticulata* from sub-arctic and arctic America belong to this species. The typical form has nearly orbicular leaves, somewhat cordate at the base. This form is well represented by specimens collected by J. M. Macoun on St. Paul Island in 1897 (Herb. Geol. Surv. Canada, no. 18875). The form of the leaves is, however, very variable. Elongated elliptic leaves, resembling those of *S. reticulata*, are not at all uncommon. The two cannot be distinguished by the leaves. In *S. orbicularis*, the bracts are broadly obovate, fuscous, *i. e.*, dark brown or dark purplish, glabrous on the lower surface, except the margin and the base, and the capsule is larger than in *S. reticulata*, and comparatively little pubescent with short fine hairs, while in *S. reticulata* it is densely woolly. Its range extends from Labrador to British Columbia and Alaska. I have seen numerous specimens.

3. SALIX RETICULATA L. Sp. Pl. 1018.

Of the typical European form with elongated catkins and oblong yellow bracts, which are densely woolly, especially at the base, I have seen no good specimens from North America. The only specimens that I have seen and which may be referred to *S. reticulata* are the following: One

from Labrador, collected by Rev. A. C. Waghorne, no. 2, 1893; one from Silver City in the Rocky Mountains, collected by *Macoun*, 1885 (Herb. Geol. Surv. Can., no. 18849), and one from the Rockies in the Herb. Hooker, Barrett and Torrey, no. 86. The first is most like the European form, differing only in the less pubescent bracts. The second has smaller leaves, short catkins and truncate bracts. It forms a connecting link with *S. saximontana* and *S. nivalis*.

4. SALIX SAXIMONTANA. *Salix reticulata* Bebb, in Coulter, Man. R. M. 339. Not L.

Densely cespitose and intricately branched; whole plant seldom more than 5 cm. above ground; bark of the older stems brown, of the young branches light yellow, glabrous and shining; bud-scales brown or yellow, perfectly glabrous; leaves light green above, glaucous beneath, on both surfaces perfectly glabrous and shining, rather strongly veined and somewhat reticulate beneath, but less so than in the two preceding; petiole about 1 cm. long; leaf-blade 1–2 cm. long, oblong or elliptic-oblong, commonly acutish at both ends; catkin 1–2 cm. long, somewhat loosely many-flowered; bracts oblong, cuneate, truncate, light yellow, almost perfectly glabrous; ovary conical, sessile, densely and finely white-tomentose, with a nearly sessile stigma; filaments glabrous or with a few long hairs on the lower portion.

This species includes all specimens that have been named *S. reticulata* from the Rocky Mountains within the United States. It differs from the European *S. reticulata* in the narrower, more acute, lighter green and less reticulate leaves, the glabrous bracts and almost glabrous filaments. In Montana it seems to grade into *S. nivalis*. The following specimens belong here:

COLORADO: Gray's Peak, 1895, *Rydberg* (type); 1861, *C. C. Parry, no. 343*; 1885, *Patterson, no. 135*; 1891, *Dr. E. Penard, no. 436*; Argentine Pass, 1878, *M. E. Jones*; 1868, *Vasey*; 1862, *Hall & Harbour, no. 521*; Pike's Peak, 1871, *Canby*.

UTAH: Bear River Cañon, 1869, *Watson, no. 1102*.

NEVADA: East Humboldt Mountain, *Watson, no. 1102*.

YELLOWSTONE PARK: 1884, *Tweedy, 33*.

MONTANA: Belt Mountains, 1883, *Scribner, no. 260.*

ALBERTA: Sheep Mountain, 1895, *Macoun* (Herb. Geol. Surv. Can., *no. 13663*). This specimen has unusually broad and obtuse leaves, therefore, approaches both *S. reticulata* and *S. nivalis*.

5. SALIX NIVALIS Hook. Fl. Bor. Am. **2**: 152; *Salix reticulata nivalis* Anders. in DC. Prod. **16**[2]: 301.

It is nearest related to *S. saximontana*, and perhaps represents only the most depauperate form thereof. It differs in the small leaves less than 1 cm. long, which are much more reticulate than in *S. saximontana*. It is much less related to *S. reticulata*. It differs in the small leaves, the 3–12-flowered short catkins and very short peduncles, the shorter and broader and almost glabrous bracts, the glabrous filaments, and shorter capsules.

S. nivalis is confined to the Rocky Mountains of British America and Montana at an altitude of 2500 to 3500 m.

MONTANA: Old Hollowtop, Pony Mts., July 7 and 9, 1897, *Rydberg & Bessey, no. 3926.*

YELLOWSTONE PARK: Electric Peak, Aug. 18, 1897, *Rydberg & Bessey, no. 3925.*

IDAHO: Mt. Chauvet, July 29, 1897, *Rydberg & Bessey, no. 3924.*

CANADIAN ROCKIES: Old Man's River, 1883, *Dawson* (Herb. Geol. Surv. Can., *no. 18843*); Avalanche Mountain, 1890, *Macoun* (*no. 18842*),* Sulphur Mountain, 1891 (*no. 18841*, *18840*[1]); Mt. Aylmer (*no. 18840*[2]); Moose Mountain, 1897; Silver City, 1885.

6. SALIX GLACIALIS Anderson, Oefvers. Vet. Akad. Foerhandl. 15, 131 and Proc. Am. Acad. **4**: 27.

The only specimens I have seen that agree with the description of *S. glacialis* were collected at Port Barrow by Murdock, *no. 29*. They are characterized by the smooth and shining light brown bark, the brown glabrous bud scales, the small, oval leaves, which are rather thin, not reticulate and

* The numbers cited in parenthesis are those of the herbarium of the Geological and Natural History Survey of Canada.

slightly silkly beneath when young. If it were not for the sessile stigmas, it would be grouped among the Arcticae, next to *S. Grocnlandica*, which it most resembles. The catkin is about 1 cm. long, many-flowered; the bracts fuscous, broadly obovate, somewhat villous, the capsule rather densely white-villous.

Arcticae.

Cespitose willows, generally only a few decimeters high, with entire-margined leaves, catkins at the ends of short leafy branches, appearing with the leaves, more or less densely white-tomentose or villous capsules and an evident style.

Leaves glabrous, or when young covered with long white hairs parallel to the midrib, in age generally glabrate.
Bracts fuscous, obovate, truncate or obtuse.
Leaves very thin, nearly orbicular; catkins few-flowered.
7. *S. polaris.*
Leaves not very thin, obovate to oblanceolate; catkins many-flowered, except in *S. tenera*.
Leaves and young twigs generally darkening in drying.
Leaf-blade rounded obovate, 10–30 mm. long; catkins 15–30 mm. long. 8. *S. diplodictya.*
Leaf-blade obovate (seldom obcordate), 25–50 mm. long; catkins 25–80 mm. long.
Leaf-blade broad, obovate or obcordate, strongly reticulate, obtuse. 9. *S. arctica.*
Leaf-blade narrower, obovate or rarely obovate-lanceolate, not strongly reticulate, often acutish.
10. *S. anglorum.*
Leaf-blade obovate, 10–20 mm. long; catkins 10–20 mm. long. 11. *S. Groenlandica.*
Leaves and yellow or light brown young twigs not darkening in drying.
Leaves strongly reticulate, subcoriaceous, their remnants more or less persistent. 12. *S. palaeoneura.*
Leaves not persistent, not strongly reticulate (moderately strongly veined only in *S. callicarpaea*).
Depressed creeping Rocky Mountain species.
Leaves obovate; catkins many-flowered.
13. *S. petrophila.*
Leaves narrowly oblanceolate; catkins few-flowered. 14. *S. tenera.*
Eastern species with erect or spreading branches.
Leaves obovate or oblanceolate, acute.
15. *S. Macounii.*
Leaves broadly obovate, obtuse.
16. *S. callicarpaea.*

Bracts fuscous, oblong, generally obtuse. 17. *S. glaucops.*
Bracts yellow, oblong.
Capsule conical, 7–8 mm. long, grayish pubescent.
18. *S. glauca.*
Capsule ovate-conical, 5 mm. long, densely white-villous.
Leaves broadly obovate, obtuse, not turning black in drying.
19. *S. Waghornei.*
Leaves broadly oblanceolate, acute, turning black in drying.
20. *S. atra.*
Leaves narrowly oblanceolate, acute, slightly darkening in drying. 21. *S. desertorum.*
Leaves finely silky pubescent, narrowly oblanceolate or lanceolate.
Young twigs densely clothed with long white villous hairs.
22. *S. niphoclada.*
Young twigs finely villous-tomentose. 23. *S. stricta.*
Leaves broadly ovate, with white, villous, almost permanent hairs, spreading in all directions. 24. *S. Labradorica.*

7. SALIX POLARIS Wahl. Fl. Lapp. 261.

This species is characterized by its slender but short branches, and by its thin, almost orbicular leaves, which are almost sessile, bright green and shining above. The capsules are moderately tomentose and the leaves very rarely indistinctly toothed. These latter characters separate it from *S. herbacea*, which it otherwise most resembles in general habit and the form and texture of the leaves. The habit is quite unlike that of the other species of the Arcticae group, but the structure of the pistil is the same.

S. polaris is a European species. A single specimen, collected by *James M. Macoun*, in 1891, at Cape Vancouver, I cannot distinguish from the European form; its occurrence there is exceedingly interesting.

8. SALIX DIPLODICTYA Traut. Nouv. Mem. Soc. Nat. Mosc. 2: 307. *S. Pallasii diplodictya* Anders. in DC. Prod. 16^2: 285.

This is nearly related to *S. arctica*, and is generally regarded as a variety of that species; but it differs in the shorter catkins and in the smaller and more rounded leaves, which are rather crowded and short petioled. The stem is less creeping than in *S. arctica* and the branches shorter. The capsule is also generally shorter and less woolly.

S. diplodictya is a native of eastern Siberia and Alaska, occurring especially on the islands. The following specimens have been seen:

ALASKA: Disenchantment Bay, 1892, *Funston, no. 117*, in part; St. Paul Island, 1892, *J. M. Macoun, nos. 135* and *207;* 1897 (*16642* and *16643*); 1879, *Dr. Robert White;* 1871–2, *Elliott;* St. George, 1892 (*no. 18880*); Hall Island, 1891 (*no. 18879*[3]); Copper Island, *L. Steineger, no. 244.*

9. SALIX ARCTICA Pallas, Fl. Ross. **2**: 86; *Salix Pallasii* Anders. in DC. Prod. **16**[2]: 285.

This has been much confused with *S. anglorum* Cham. (*S. arctica* R. Br.). It has the long and thick catkins of that species; but the habit is somewhat different, more bushy, sometimes a couple of meters high; the leaves are much broader, thicker, and more strongly veined, and the capsules are more hairy.

S. arctica is a native of Eastern Siberia and Arctic America. It is most common in Alaska, but has been collected as far east as Labrador. The following specimens belong here:

EASTERN SIBERIA: Plover Bay, 1865–6, *W. H. Dall;* Berings Island, 1891, *J. M. Macoun* (*no. 18884*[3]).

ALASKA: Disenchantment Bay, 1891, *Funston, no. 117*, in part; Silver Bow Basin, *Gracc E. Cooley;* Unalaska, *Chamisso;* 1871–2, *M. W. Harrintgon; Langsdorf;* 1891, *J. M. Macoun, no. 136;* (*nos. 18886; 18883*[3]); St. Paul Island, 1879, *Robert White;* 1897, *J. M. Macoun* (*16640, 16640a* and *18884*[1], also *18882* and *18883*[3]); Hall Island, 1891, *J. M. Macoun* (*18879; 18884*[2] and *18887*); Attu Island (*no. 18883*[2]); Kyska, 1873, *W. H. Dall;* Chilcat, 1883, Meehan.

LABRADOR: Hudson Strait, Nottingham Island, 1884, *R. Bell* (*18825*[2]).

SALIX ARCTICA OBCORDATA Anders. in DC. Prod. **16**[2]: 285.

Differs from the species in the larger leaves, which are obcordate at the apex. Specimens examined:

ALASKA: St. Paul, *J. M. Macoun* (*16641*); Atkla Island, 1881, *L. M. Turner;* Unalaska, 1871, *M. W. Harrington.*

10. SALIX ANGLORUM Cham. Linnaea, 6: 541. 1831. *Salix arctica* R. Br. Ross. Voy. Ed. 2, 2: 194. Not Pall. *Salix Brownii* (Anders.) Lundst. Nov. Act. Soc. Sc. Upsal. 16: 6; *Salix arctica Brownii* Anders.; DC. Prod. 16²: 286. 1868.

There is scarcely a species that has been so misunderstood as this. Even Mr. Bebb, who cleared up somewhat the discrepancy between *S. arctica* Pallas and *S. arctica* R. Br., had a very vague idea about the latter, for he included under the name *S. Brownii* a number of quite distinct forms. The more or less fruticose species named *S. arctica* or *S. Brownii* from the Rocky Mountains, Canada, Newfoundland and Labrador do not belong here. *S. anglorum* is an arctic species and takes the place of *S. arctica* in the East. It is characterized by the rather long and prostrate branches, only the flowering branchlets being erect; the thin obovate or lance-obovate leaves; the exceedingly large catkins, which are rather loosely flowered below, and the large conic capsule, which is only moderately hairy.

Anderson cites *S. anglorum* Cham. as a synonym of *S. phlebophylla*. As Chamisso does not describe any species and does not cite any specimens, but only gives the name and *S. arctica* R. Br. as a synonym, *S. anglorum* must be regarded as equivalent to that species. The name *S. anglorum* must be therefore used, as it antedates *S. Brownii* by thirty-seven years.

ANTICOSTI: 1883, *Macoun, no. 18818.*

LABRADOR and HUDSON BAY: Whale River, 1896, *Spreadborough (13636 a* and *b)*; Ford's Harbor, 1884, *R. Bell (18833)*; Hamilton River, 1894, *A. P. Low, 6050;* Ungava River, 1886, *Spreadborough (13637b)*; Cape Prince of Wales, 1884, *R. Bell (18831)*; Nottingham Island (*18828*[1,3]); Upper Savage Island, 1821, *Parry;* Lake Petitsikipan, 1894, *A. P. Low, 6049;* Lake Athabaska and Chesterfield Inlet, 1893, *J. W. Tyrell* (18834), James Bay, 1887, *J. M. Macoun* (18827).

BAFFIN BAY REGION and GREENLAND: Whale Sound,

Dr. H. E. Wetherill, *226;* Inglefield Gulf, *no. 220;* Cumberland Gulf, 1877–8, *L. Krumlien.*

NORTHWEST TERRITORY: Franklin Expedition, *Dr. Richardson* (Type); Mackenzie River, *Herb. Hooker*, *Barratt & Torrey*, *no. 93;* also 1886, *R. Bell.*

ALASKA: Juneau, 1891, *Grace Cooley.*

ARAKAMTCHETCHENE ISLAND: 1853–6, *C. Wright.*

11. SALIX GROENLANDICA (Anders.) Lundst. Nov. Act. Soc. Sc. Upsal. **16**: 36; *Salix arctica Groenlandica* Anders. in DC. Prod. **16**^{2}: 287.

This is nearest related to *S. glauca*, although Anderson placed it as a variety of *S. arctica.* From the former it differs by the obovate fuscous bracts, the shorter capsule and the more permanent hairs on the leaves. With *S. arctica* and *S. anglorum* it agrees only in the form of the bracts. The branches are seldom prostrate as in those species, the leaves are small and short-petioled and the catkins are short and dense. It is a native of GREENLAND and the islands of BAFFIN BAY. The following specimens have been seen:

White Whale Sound, 1891, *W. H. Burke;* Kingigtordtagolit, 1887, *Ryder* (G. S. C., *18874*); Ingelfield Gulf, 1894, *H. E. Wetherill*, *219;* Robertson Bay, 1894, *no. 217;* Southwest Carey Island, *no. 216;* Disco Island, *no. 215;* Godthalb, *no. 207;* 1871, *Th. Frics;* Fiskenaes, 1889, *H. Hartz;* West Greenland, 1884, *E. Warming;* Godham, *Begeus;* Polaris Bay, *Dr. Bessel;* Greenland, *Holboell;* Grinnell Land, *A. W. Greeley;* Gale Point, 1861, *Durand;* Disco, 1891, *W. H. Burke*, *no. 38.*

LABRADOR: Ford's Harbor, 1884, *R. Bell* (*18828*^{2}).

12. SALIX PALAEONEURA.

Low, cespitose, generally less than 1 dm. high; branches brown and shining, covered by the framework of old leaves; buds dark brown, glossy, perfectly glabrous; leaves obovate or elliptic oblong, less than 1 cm. long, subcoriaceous and somewhat brownish, strongly reticulate, almost sessile or short petioled, perfectly glabrous and shining; catkins about 1 cm. long and 6 mm. in diameter, almost sessile and densely

flowered; bracts obovate, truncate, fuscous, hairy with long white silky hairs; filaments long and slender, 2–3 times as long as the bracts; capsule more or less densly white tomentose, oblong-ellipsoid, tipped with an evident style, which is about .5 mm. long; stigmas 2, 2-cleft.

This is characterized by its short shining branches, almost sessile leaves and catkins, and the small crowded shining leaves, which are very strongly veined. The leaves remain for several seasons on the stems, their soft parts having decayed, leaving the netted skeleton of veins remaining. The leaves remind us on the one hand of those of *S. glacialis* and *S. phlebophylla* and the other of those of *S. retusa* and *S. Dodgeana*. The structure of the catkin is that of a typical representative of the Arcticae group. The capsule is hairy, with a distinct style and the bracts are covered by the characteristic long white hairs.

The only specimens I have seen were collected at Point Barrow by *Murdock*, *no. b.*, preserved in the Gray Herbarium.

13. SALIX PETROPHILA. *Salix arctica petraea* Anders. in DC. Prod. 16^2 : 287. Not *S. petraea* Anders.

This should, I think, be regarded as a distinct species, differing from *S. anglorum* in the following respects: The leaves are narrower and greener; the branches are more slender and do not turn blackish in drying; the catkins are much smaller and narrower, and the capsule is shorter, rather ovoid and more densely villous. It is, however, much nearer to *S. anglorum*, than the species of the Rockies that have been regarded as that species. It grows at an altitude of 2500 m. or more.

COLORADO: 1872, *C. C. Parry;* 1878, *M. E. Jones*, *no. 722; Hall & Harbour*, *nos. 520* and *187*; Gray's Peak, 1885, *H. N. Patterson*, *no. 136;* 1871, *Geo. Smith;* 1868, *Vasey*, *no. 534.*

UTAH: 1879, *M. E. Jones*, *no. 1241.*

WYOMING: Teton Forest Reserve, 1897, *Tweedy*, *no. 291.*

YELLOWSTONE PARK: Upper Falls, 1871, *Robert Adams;* Stinking Water, 1885, *Tweedy*, *no. 485.*

MONTANA: Mill Creek, 1887, *Tweedy*, *no. 271;* Boulder Creek, *no. 272;* Old Hollowtop, near Pony, July 7, 1897, *Rydberg & Bessey;* Rocky Mountains, 1861, *Lyall;* Upper Marias Pass, 1883, *Canby*, *nos. 289*, *290* and *291;* McDonald's Peak, *no. 288.*

OREGON: Powder River, 1886, *Cusick*, *no. 1361.*

CALIFORNIA: Sierra Nevada, 1877, *Lemmon;* Mt. Dana, 1864, *Brewer*, *no. 1734*; Mt. Brewer, 1866, *Bolander*, *no. 2804;* Lemmon, *208;* Mt. Stanford, *no. 105;* Summit Valley, 1882, *Pringle.*

BRITISH COLUMBIA: Roger's Pass, 1890, *J. Macoun (18814);* Kicking Horse Lake (*18813*); Asoulican Glacier (*18832*); Selkirk Range, 1885 (*18816*); Kootanie Pass, 1883, *Dawson* (*18815*).

ALBERTA: Sulphur Mountain, Banff, 1891, *Macoun* (*18812*); Mt. Aylmer, 1891, *Macoun* (*18811*); 1895 (*13688*); 1858, *E. Bourgeau.*

NORTHWEST TERRITORY: Mackenzie River, 1886, *R. Bell* (*1882*0^4).

14. SALIX TENERA Anders. in DC. Prod. **16**^{2}: 288.

This is nearly related to the preceding, differing in the narrow oblanceolate leaves and the few-flowered catkins. The capsule is also much shorter. It grows at an altitude of 3000 m. or more.

WASHINGTON: *Lyall* (Type).

CALIFORNIA: Tulare Co., *J. W. Congdon.*

UTAH: Bear River, 1869, *Watson*, *no. 1101.*

MONTANA: (?) Boulder Creek, 1887, *Tweedy*, *no. 273;* Electric Peak, August 18, 1897, *Rydberg & Bessey*, *no. 3922.* (The last specimens are exactly like the type.).

15. SALIX MACOUNII.

A small shrub with numerous ascending, light brown branches, which are glabrous, or very soon glabrate; leaves small, about 2 cm. long, dark and shining above, paler beneath, obovate or broadly oblanceolate, acute; catkins 2–3 cm. long, rather looser than in *S. atra;* capsule 7–8 mm. long, rather loosely villous, ovoid, with an evident style.

In the size and form of the leaves, this resembles *S. atra*. The leaves are, however, less inclined to turn back, and resemble much those of *Vaccinium uliginosum*. The catkin is looser than in *S. atra* and the capsule much larger and less villous. The following specimens belong here:

ANTICOSTI: Ellis Bay, 1883, *Macoun* (*18830*, type).

HUDSON BAY: Diggs Island, 1884 (*18820*[3] and *18825*); Mansfield Island, (*18819*[2] and *18820*[5]).

LABRADOR: Ford's Harbor, 1884, *R. Bell* (*18819*[1]); Cape Chudley (*18819*[4]).

16. SALIX CALLICARPAEA Trautv. Nouv. Mem. Soc. Nat. Mosc. 259.

It differs from the preceding by its broadly obovate obtuse bright green leaves. As it is a much lower plant with more depressed stems, it might have been placed nearest to *S. petrophila* which it resembles in the color and texture of the leaves. From that species it is easily distinguished by the small broad leaves and the short petioles.

QUEBEC: Mt. Gaspé, 1882, *Macoun* (*18826*).

LABRADOR: Nachhak, 1884, *R. Bell* (*18819*[3]).

17. SALIX GLAUCOPS Anders. in DC. Prod. **16**[2]: 281. 1868. *Salix glauca villosa* Anders. Sal. Bor. Am. 22; *S. villosa* Don. Hook. Fl. Bor. Am. **2**: 144. 1840. Not Scheich. 1815.

This represents *S. glauca* in the Rocky Mountains. It differs in the shorter capsule, the darker, fuscous and acutish bracts and the denser pubescence of the leaves. In age, the leaves, however, often become glabrous (var. *glabrescens* Anders.); this is especially the case at high altitudes, and as it then is very low it has been mistaken for *S. anglorum* (*S. Brownii* Lundst.), which is an arctic species. At lower altitudes it becomes a taller shrub, often 1 m. high, and would then scarcely be classified among the cespitose willows. Specimens with mature leaves much resemble *S. chlorophylla;* it scarcely differs indeed from that species except by the fact that in *S. glaucops* the catkins are at the end of

short leafy branches, while in *S. chlorophylla* they are naked from lateral buds. *S. glaucops* grows on mountain sides at an altitude of 2–3000 m., while *S. chorophylla* grows in cold bogs.

MONTANA: Gallatin Co., 1886, *Tweedy*, *no. 1184;* East Boulder Plateau, 1887, *nos. 270a* and *274;* Yogo Baldy, Little Belt Mts., 1896, *Flodman*, *no. 367;* McDonald's Peak, 1883, *Canby*, *no. 284.*

YELLOWSTONE PARK: Yellowstone Falls, Aug. 27, 1871, *Robert Adams* in the Hayden Survey (pistillate flowers only; the staminate flowers belong to another species); 1884, *Tweedy*, *no. 34.*

IDAHO: Mt. Chauvet, July 29, 1897, *Rydberg* and *Bessey*, *no. 3914.*

WYOMING: Sheep Mountain, 1897, *Tweedy*, *no. 297;* Black Rock Creek, *no. 295.*

18. SALIX GLAUCA L. Sp. Pl. 1019.

Salix glauca is apparently rare in America, and probably confined to the extreme northeast portion. It is characterized by its rather lax catkins, its oblong yellow bracts and very long conical capsule. The following specimens belong to it:

GREENLAND: Disco, 1894, *Dr. H. E. Wetherill*, *nos. 205 and 206;* Kvanefjord, *Rosenvinge* (var. *alpina*, with very small leaves).

LABRADOR: Martin, *nos. 2* and *4.*

ALASKA: Nurkagak, 1881, McKay.

19. SALIX WAGHORNEI. *Salix cordifolia* Hook. Fl. Bor. Am. **2**: 152. 1840. Not Pursh, 1814. *S. alpestris Americana* Anders. Proc. Am. Acad. **4**: 23. 1858. Not *Salix lanata Americana* Anders. l. c. 13.

This species is most nearly related to *S. glauca* and *S. Labradorica.* From the former it differs in the broader leaves, which are mostly obtuse at both ends, the shorter, ovate-conical, and more densely villous capsule. In the form of the leaves and the structure of the catkins it more resembles *S. Labradorica*, but lacks the peculiar pubescence of

that species. The leaves are somewhat hairy when young, but the long white hairs are, as in *S. glauca*, appressed and parallel to the midrib. The pubescence of the young shoots is more scant and earlier deciduous. The following specimens belong here:

LABRADOR: Type in Herb. Torrey ("*Fl. Am. Bor.*"); 1860, *Dr. Bryant;* 1895, *A. P. Low* (G. S. C., *13687*); Red Bay, 1894, *A. C. Waghorne;* 1892, Belle Harbor, *no. 106;* Cartrage Bay (*18838*); Seal Harbor, (*18836, 15*).

20. SALIX ATRA.

A low shrub, with ascending dark brown branches which are more or less villous when young; leaves small, 1.5–2.5 cm. long, broadly oblanceolate, acute at both ends, when young covered with long white hairs, which are appressed and parallel to the midrib, dark above, pale beneath, turning blackish in drying; catkins 1.5–3 cm. long, rather dense; bracts oblong, yellowish, more or less villous; capsule 3–5 mm. long, ovoid, densely white-woolly, style manifest.

It differs from *S. glauca* in the smaller leaves, which turn black, the denser catkin, and the shorter and more woolly capsule. The following specimens belong here:

LABRADOR: Ford's Harbor, 1884, *R. Bell* (*18823*); Nain (*18820*).

HUDSON BAY: Upper Savage Island, 1884, *R. Bell* (*18823*).

21. SALIX DESERTORUM Richardson, in Frankl. Journ. App. 371.

The plant collected and described by Richardson is quite unlike the plant that generally goes under the name of *S. desertorum*. The original is not at all silvery-pubescent. It is hairy only when young, and the leaves turn dark in drying. Its nearest relative is *S. atra*, from which it differs mainly in the narrower leaves.

NORTHWEST TERRITORY: Fort Franklin on the Mackenzie, *Richardson;* Rocky Mountains, *Drummond, no. 658.*

22. SALIX NIPHOCLADA.

Stem slender, terete, grayish, more or less villous hairy;

young branches densely covered with long snowy-white villous hairs; buds also densely covered with white hairs; stipules small, about 2 mm. long, ovate; leaves nearly sessile, broadly lanceolate, 15–25 mm. long, acute, more or less pubescent above, tomentose beneath, more or less darkening in drying; catkins borne at the ends of short leafy branches, 2–3 cm. long; bracts narrowly oblong, light colored; capsule conic, about 5 mm. long, tomentose, tipped with a style 5 mm. long.

It is apparently nearest related to *S. stricta*, from which it differs in the longer and rather denser hairs of the young twigs, the less pubescent and darker leaves, the longer catkins, and the smaller, less densely tomentose capsule. The type was collected on the Mackenzie River, *Miss E. Taylor, no. 60*, 30 miles north of the Arctic Circle, in 1892, and is preserved in the Geological Survey of Canada (*no. 18839*).

23. SALIX STRICTA (Anderson): *Salix desertorum stricta* Anders. in DC. Prod. 16[2]: 281; *S. desertorum* Bebb, in Coulter, Man. R. M. 338.

It is evident that Mr. Bebb did not exactly know the true *S. desertorum*, as he states that *Drummond, no. 657*, represents the typical form. *Drummond, no. 658*, mounted on the same sheet in the Torrey Herbarium, is quite different and matches Richardson's specimens exactly. The leaves are only slightly hairy, and in the dry specimens dark. They are not at all yellowish silky as is the shrub found in the Rocky Mountain Region of United States. The catkins are longer than in our plant, and the bark is dark. In *S. stricta* the bark is often yellowish or grayish.

MONTANA: Cutbank Creek, 1883, *Canby, nos. 294* and *286;* Red Mountain, 1888, *Tweedy, no. 38.*

YELLOWSTONE PARK: Lower Geyser Basin, August 4, 1897, *Rydberg & Bessey, no. 3913.*

ALBERTA: Rocky Mountains, *Drummond, no. 657.*

LOWER CANADA: Mt. Albert, 1881, *J. A. Allen.*

WYOMING; Centennial Valley, 1895, *Aven Nelson;* Gros Ventre Creek, 1897, *Tweedy, no. 298.*

COLORADO: 1873, *John Wolfe, no. 819;* Twin Lakes, 1872, *T. C. Porter.*

24. SALIX LABRADORICA.

A low shrub, perhaps not properly included among the cespitose species; older bark dark brown and shining; the young shoots more or less densely villous; leaves broadly ovate, often obtuse or subcordate at the base, rather firm, dark and glossy above, more or less glaucous beneath, on both surfaces invested with white villous hairs, which are spreading in all directions; catkins densely many-flowered; bracts oblong, brown, villous; capsule 6–8 mm. long, ovoid-conic, densely white-villous; style rather short; stigmas two, slightly two-cleft.

It is nearest related to *S. glauca*, from which it differs in the broader leaves and their pubescence, the stouter branches and the shorter capsules.

LABRADOR: Turner's Head, 1892, *Rev. A. C. Waghorne, nos. 36* and *63;* Battle Harbour, 1892, *no. 21;* Seal Harbor, 1892 (*G. S. C. 18829*); Battle River (*18838, 16*); Nacwak, *R. Bell*, 1884 (*18821*).

OVALIFOLIAE.

Low and densely cespitose willows, generally depressed and rooting, with entire-margined leaves 1–2 cm. long and many-flowered catkins; capsule glabrous or merely puberulent; style generally present, but often short.

Leaves strongly reticulate; style about .5 mm. long.
  Leaves orbicular, often subcordate at the base and retuse at the apex. 25. *S. cyclophylla.*
  Leaves oval. 26. *S. ovalifolia.*
Leaves not strongly reticulate, rather thin.
  Leaves oval, glabrate.
    Petioles less than 5 mm. long; style about 1 mm. 27. *S. phlebophylla.*
    Petioles 5–20 mm. long; style about 1.5 mm. 28. *S. Unalaschensis.*
  Leaves oblong-lanceolate, pubescent. 29. *S. Wolfii.*

25. SALIX CYCLOPHYLLA.

A depressed shrub with rather slender branches, which are slightly villous when young; petioles 5 mm. or less long; leaf-blade almost orbicular, often subcordate at the base and emarginate at the apex, dark green and shining when old, somewhat villous when young, strongly reticulate and pale beneath; catkins short, but dense, 1–1.5 cm. long, 1 cm. in

diameter; bracts obovate, obtuse, fuscous, villous-ciliate; capsule acuminate-conic, glabrous; style about .5 mm. long.

It is nearest related to *S. ovalifolia*, from which it differs mainly in the broad leaves. Specimens:

ALASKA: St. Paul's Island, 1897, *J. M. Macoun* (*16645*, Type); 1896 (*18881*); 1891 (*18877*); Cape Vancouver (*18878*); Hall's Island (*18876*).

26. SALIX OVALIFOLIA Trautv. Nouv. Mem. Soc. Nat. Mosc. **2**: 306.

It is characterized by its oval reticulate leaves, glabrous capsules, and short style. The following specimens have been examined:

ALASKA: St. Paul Island, 1897, *J. M. Macoun* (*16644*); 1874, *Mrs. Macintyre;* Point Barrow, *Prof. Murdock.*

27. SALIX PHLEBOPHYLLA Anders. Oefv. Vet. Akad. Foerh. **15**: 132 and Proc. Am. Acad. **4**: 27. (Both 1858.)

This resembles *S. ovalifolia* in many respects, but the leaves are thin and not strongly reticulated, the catkins are longer, about 2 cm. long, the style is about 1 mm. long, and the capsule somewhat puberulent when young. I refer the following specimens here:

ARCTIC COAST: (Herb. *Hook., Barratt & Torr., no. 96;* type).

ALASKA: Cape Blossom, 1884, *S. B. M.*; St. Paul Island, 1879, *Robert White.*

BEHRING STRAIT and ARAKAMTCHATCHENE ISLAND, 1853–6, *C. Wright.*

28. SALIX UNALASCHENSIS Cham. Linnaea, 6: 539.

I take the following specimens to belong to this species. The original description is rather meagre and it is hard to tell what the species really is. The specimens before me have thin glabrous leaves, with a broadly obovate blade 2–3 cm. long, on a petiole of about the same length. The catkins are rather loose, with the peduncle 3–4 cm. long. The capsule is glabrous, about 6 mm. long and with a style fully 1.5 mm. long. The specimens were labeled *Salix ovalifolia*,

with which it could scarcely be confused. It is much nearer related to *S. phlebophylla*, from which it differs mainly in the longer petioles and styles.

ALASKA: Silver Bow Basin, above Juneau, 1891, *Grace Cooley* (in the Columbia Herbarium).

29. SALIX WOLFII Bebb, Bot. Wheeler Exp. 241; *Salix desertorum Wolfii* Bebb, in Coulter, Man. R. M. 338.

This has been placed in this group on account of its glabrate capsule. It is true that at first it is somewhat puberulent, but that is also the case in *S. phlebophylla* and probably in all the species of the group. It resembles somewhat *S. desertorum* in habit, but cannot be regarded as a form of that species. In the form of the leaves it resembles more *S. glaucops*. It grows in alpine regions of the Rockies.

COLORADO: South Park, 1873, *J. Wolf*; Gray's Peak, 1872, *Torrey*.

WYOMING: Big Horn Mountains, 1898, *Tweedy*.

YELLOWSTONE PARK: 1886, Tweedy, *no. 481*; 1884, *no. 35*.

RETUSAE.

Very small, depressed cespitose willows, at most only a few cm. high, with very small leaves, less than 5 mm. long and with entire margins; catkin few- (in ours 2–4-) flowered; capsule glabrous with an almost sessile style.

Leaves orbicular, often retuse.	30. *S. rotundifolia.*
Leaves oblong-elliptic.	31. *S. Dodgeana.*

30. SALIX ROTUNDIFOLIA Trautv. Nouv. Mem. Acad. Mosc. 2: 304. 1832.

It is characterized by its small nearly orbicular leaves, less than 5 mm. long, which are generally subcordate at the base and retuse at the apex, by its 2–4-flowered catkins, glabrous capsule and almost sessile style.

ALASKA: Unalaska, 1891, *J. M. Macoun*, *nos. 139, 213* and (*18885*); Point Barrow, *Murdock*, *no. 24*; Attu Island, 1879, *L. M. Turner*, *no. 1293*, in part.

BEHRING STRAIT and ARAKAMTCHATCHENE ISLAND: 1853–6, *C. Wright*.

31. SALIX DODGEANA.

A delicate suffruticose little plant, scarcely more than 2 cm. high above ground: stems slender, but short, mostly subterranean, with brown bark; shoots, at least when young, with yellowish green bark, densely covered with leaves, the whole plant perfectly glabrous except the margins of the bracts; leaves 4–5 mm. long, oblong or oval, acutish or obtuse, light green, strongly veined; pistillate catkins generally 2-flowered; bracts oblong, truncate, sparingly villous-ciliate; capsule oblong-ovoid, glabrous, with two sessile 2-cleft stigmas; staminate catkin sgenerally 3–4-flowered; stamens 2, with slender glabrous filaments more than twice as long as the bracts, and short anthers.

This is nearest related to *S. rotundifolia*, which, however, has nearly orbicular, often emarginate leaves and more strongly ciliate obovate bracts. *S. Dodgeana* is, as far as known, the smallest willow in existence. At the original locality it was found covering whole acres of ground, growing on the mountain side at an altitude of 3200 m. Mr. Tweedy collected his specimens at about the same altitude. It is dedicated to Mr. William E. Dodge, of New York City, a sincere friend and patron of botany.

YELLOWSTONE PARK: Electric Peak, Aug. 18, 1897, *Rydberg & Bessey*.

WYOMING: Sheep Mountain, Teton Forest Reserve, 1897, *Tweedy, no. 292*.

Specimens with slightly larger and more acute leaves, but which apparently belong to this species, have been collected farther north, viz:

ALASKA: Atka Island, 1879, *Turner, no. 1293*, in part.

HERBACEAE.

Low cespitose willows, sometimes 1–2 dm. high, with more or less serrate or dentate leaves, glabrous capsules and a short style.

Leaves orbicular. 32. *S. herbacea*.
Leaves cuneate to obovate. 33. *S. Uva-ursi*.

32. SALIX HERBACEA L. Sp. Pl. 1018.

Its range extends from the White Mountains of New Hampshire to the Arctic coast.

33. SALIX UVA-URSI Pursh, Fl. Am. Sept. 610.

From the mountains of New York to Labrador.

The following species may perhaps be regarded as cespitose willows, as they are sometimes very low.

Salix chlorophylla And. from the Rockies and *S. phyllicifolia* from the mountains of northern New England, which closely resemble *S. glaucops*, but in these the catkins are from naked buds.

Salix monticola Bebb, from the Rockies, with pedicelled capsules and serrate leaves.

Undescribed Species from the Southern United States.

BY JOHN K. SMALL.

ALETRIS LUTEA.

Perennial. Foliage glabrous, yellowish: stems scape-like, erect, 3–9 dm. tall, simple, furnished with a few narrow scales: leaves mainly basal: blades linear to linear-lanceolate, or sometimes broadest above the middle, 4–12 cm. long, acuminate, entire, dilated at the base: racemes 4–20 cm. long, with subulate bracts: pedicels barely 1 mm. long: perianth yellow, cylindric or constricted above the middle, 8–9 mm. long; segments ovate, spreading: styles united, elongated: capsule conic-ovoid, gradually narrowed into the beak; this about one-half as long as the body.

In low pine lands, Florida to Louisiana. Spring and summer.

Aletris lutea stands between the well-known *Aletris farinosa* on the one hand and *Aletris aurea* on the other. Doubtless, plants belonging to the species just described have been the main cause of the imperfect understanding of *A. aurea*, chiefly, as far as I can see, on account of the yellow perianth common to both species. But beyond this rather superficial character the two plants have little that would warrant associating them closely. By all other characters of importance *Aletris lutea* has its alliance with *A. farinosa*, having the elongated cylindric perianth of that species as well

as its habit, and not the campanulate perianth characteristic of *A. aurea*. From its natural ally, *A. farinosa*, *A. lutea* may readily be distinguished by the yellow perianth, which is usually more mealy without, and the gradually narrowed capsule, the beak of which is only one-half as long as the body, whereas the capsule of *A. farinosa* is abruptly narrowed into the beak, which is about as long as the body.

The following specimens are referred here:

FLORIDA: *Chapman;* St. Augustine, May and June, 1872. *Mary C. Reynolds;* Duval County, *A. H. Curtiss*, N. A. Pl. no. 2841, Jacksonville, Second Dist. N. A. Pl., no. 4777; Eustis, *G. V. Nash*, Pl. Centr. Penins. Fla., no. 540; Eustis, Pl. of Fla., no. 2053.

ALABAMA: Mobile, May and June, 1867, *C. Mohr*.

MISSISSIPPI: Scranton, *C. L. Pollard*, First Distr. of Miss. Pl., no. 1195.

LOUISIANA: New Orleans, *Dr. Ingalls;* Alexandria, *J. Hale*.

ALLIUM ALLEGHENIENSE.

Bulbs narrowly ovoid, 1–2.5 cm. long, with membranous coats. Leaves few, erect or ascending; blades narrowly linear, 2–3 dm. long, 2–4 mm. broad; scapes erect or ascending, 3–5 dm. tall, 2-edged at least at maturity, commonly overtopping the leaves: umbels 12–40-flowered, nodding: pedicels 1.5–2.6 cm. long, nearly filiform, becoming much thicker at maturity, pink or purple: perianth purple, often deeply so, mostly urn-shaped, 4–5 mm. high; segments oval or nearly so, outer obtuse or notched at the apex, manifestly shorter than the inner: capsules 4–5 mm. high, with 2 large processes to each valve.

On cliffs or in rocky soil, Virginia to North Carolina, Tennessee and Georgia. Summer and fall.

This takes the place of *Allium cernuum* in the South. I first observed the plant in company with Mr. Heller in the mountains of North Carolina, and we have since collected specimens at localities north and south of the first observed station. The peculiar urn-shaped perianth with its deep purple color and the obtuse or notched outer segments are sufficient to dis-

tinguish it from its northern relative. Specimens belonging to this species more or less widely distributed in herbaria are:

VIRGINIA: Mt. Crawford, *Heller*, no. 1203.

NORTH CAROLINA: Blowing Rock, *Heller*, no. 168 (1890), and August 24, 1893; *Small*, August, 1891.

TENNESSEE: Buffalo Rock, Wolf Creek, September, 1894, *H. Allen* (Ex. Herb. A. Ruth).

GEORGIA: Yonah Mountain, September 4, 1894, *Small*.

DONDIA CONFERTA.

Perennial, shrubby. Stems erect or ascending, 4–10 dm. long; branches prostrate or spreading, forming dense tufts, glabrous: leaves numerous, glabrous; blades fleshy, oblong, mostly less than 1 cm. long, obtuse: flowers solitary or clustered in the axils of the rather approximate leaves, especially numerous on the branchlets: calyx-segments obtuse: seeds about 1 mm. broad.

Along the coast of Texas. Spring and summer.

Only one shrubby *Dondia* has hitherto been known to occur in Texas, this being *Dondia suffruticosa*, a native of the western part of the State. In the summer of 1894 Mr. Heller collected specimens of another shrubby species, apparently different from anything heretofore described. The two Texan species may be separated by the characters contrasted in the following key:

Foliage copiously pubescent; leaf-blades and calyx-segments acute.	1. *D. suffruticosa*.
Foliage glabrous; leaf-blades and calyx-segments obtuse.	2. *D. conferta*.

The type has been distributed by Mr. Heller in his Plants of Southern Texas, no. 1827.

AQUILEGIA COCCINEA.

Perennial, rather stout, light green. Stems solitary or tufted, 3–8 dm. tall, erect or ascending, usually branching above, commonly sparingly pubescent about the nodes; leaves larger than those of *A. Canadensis*, otherwise quite similar; leaflets with 3 main lobes or divisions, glaucous beneath; segments incised or lobed, suborbicular to cuneate in outline: pedicels minutely glandular-pubescent: sepals ovate-lanceolate, acute or short-acuminate, 17–21 mm. long, scarlet: co-

rollas mainly scarlet: spurs 3–3.3 cm. long, rather abruptly narrowed below the middle, the lamina yellow: styles not twice as long as the ovary: follicles straight, 2 cm. long, tipped by the erect style which is much shorter than the body.

On cliffs and in rocky woods, western Virginia to Missouri and Nebraska, south to Alabama. Spring.

The species just described is, in many respects, between *Aquilegia Canadensis* and the western *A. formosa*. As far as I can learn it has never been described, but has been referred to *Aquilegia Canadensis* in the east, and to both *A. Canadensis* and *A. formosa* in the western parts of its range.

The habit of *Aquilegia coccinea* resembles that of its western relative, but the structure of the calyx and corolla is more nearly like that of the eastern plant. Both of these organs are conspicuously larger than those of *A. Canadensis:* the sepals are over fifteen millimeters long, are ovate-lanceolate and acute or acuminate as compared with the small broadly ovate and relatively blunt sepals of the common eastern species; the spurs, too, are much stouter and abruptly narrowed near the apex instead of gradually narrowed from near the base.

The following specimens belong here:

VIRGINIA: Banks of the Roanoke River, May 29, 1890, *A. Brown;* Peaks of Otter, June 7, 1890, *N. L. Britton;* Slopes of White Top Mountain, May 28, 1892, *E. G. Britton* and *A. M. Vail.*

KENTUCKY: 1840, *C. W. Short.*

TENNESSEE: Nashville, June, 1894, *E. P. Bicknell;* Bluffs of the Tennessee River, Knoxville, May, 1897, *A. Ruth*, no. 1726.

MISSOURI: St. Louis, May and June, 1843, *N. Richl*, no. 389; on rocks, Jackson county, May 17, 1893, *B. F. Bush*, no. 3; also Courtney, May 5, 1895, no. 8.

NEBRASKA: Peru, July, 1889, *H. J. Webber.*

HYPERICUM GLOMERATUM.

A branching shrub varying from 3–10 dm. in height, with somewhat scaly bark. Foliage glabrous: leaves rather

numerous; blades narrowly oblong to linear-oblong or nearly linear, 2–4 cm. long (or those clustered in the axils shorter), more or less distinctly apiculate, often somewhat revolute, paler beneath than above, sessile: flowers in dense cymes terminating the branchlets: pedicels 2–8 mm. long: buds ovoid, acutish: sepals rather foliaceous, narrowly oblong to linear-oblong, 5–6 mm. long, acutish, strongly nerved, reflexed at maturity: petals bright yellow, cuneate-spatulate, fully 1 cm. long, undulate at the apex: stamens numerous: capsules densely clustered, oblong-ovoid, 5–6 mm. high, slightly lobed.

On mountain slopes and summits, North Carolina, especially on the Grandfather and Table Rock. Summer.

Experience with the genus *Hypericum* in both the field and the herbarium, has convinced me that several of its groups are still quite imperfectly understood. One of these groups is that represented by *Hypericum prolificum* and *H. densiflorum*. When compared with one another these two species are sharply defined, but specimens from the southern Alleghenies have been accumulating in our herbaria which, although placed in one or the other of the above mentioned species by some authors, must be rigidly excluded in order to preserve natural limitations. The specimens referred to represent a species which seems to be peculiar to the higher peaks of both the Blue Ridge and Alleghenies proper where I have observed it on several mountain summits. It was collected before the middle of the present century, but mature fruit was not seen until Mr. A. M. Huger secured it on Grandfather Mountain during the summer of 1896.

Hypericum glomeratum may be separated from *Hypericum prolificum* by the small size of all its organs, especially the smaller corollas, and by the terminal inflorescence. Both of these characters suggest *Hypericum densiflorum*, but the organs of this species are still smaller, the corolla being only one-half as large and in place of the open cymes the inflorescence is characteristically congested.

The following specimens should be placed here:

North Carolina: Pinnacle Mountains, *Rugel*, August, 1842; Table Rock, *A. Gray*, summit of Table Rock, *A. A.*

Heller, August 2, 1890; Grandfather Mountain, *A. M. Huger*, August, 1896.

Callirrhoë geranioides.

Perennial, closely pubescent with very short hairs. Stems mostly branched at the base; branches ascending or spreading, 1–3 dm. long, simple or nearly so: leaves few; blades 2–2.5 cm. broad, pentagonal in outline, 5-lobed, or 5-cleft, cordate; lobes cuneate, coarsely toothed or cleft, mostly rounded or obtuse: petioles longer than the blades: peduncles surpassing the leaves, often 8–10 cm. long: bractlets linear or linear-oblong, acute: calyx rather conspicuous, 10–12 mm. long, about twice as large as the bractlets; segments lanceolate, somewhat acuminate: petals pinkish or pink-purple, minutely eroded at the top, 2–2.5 cm. long.

In sandy bottoms, southern Texas. Spring and summer.

Callirrhoë geranioides is related to *C. involucrata* but it is a smaller plant. The leaf-blades are conspicuously smaller and the segments merely crenate or in some cases incised-crenate. The peduncles are fully twice or usually thrice as long as the subtending leaves, these organs in *C. involucrata* are about as long as the leaves, sometimes a little shorter or slightly longer.

The original specimens were collected by A. Schott, on the Mexican Boundary Survey. The label accompanying the specimens bears this record: Rio Bravos del Norte. Cañon between Eagle Pass and Laredo, on sandy bottom land, March, April, 1852.

Passiflora Bigelovii.

A slender climbing vine with glabrous foliage. Leaves rather numerous; blades as long as broad or nearly so, 1–8 cm. broad, reticulated at maturity, deeply 3-lobed; middle lobe usually cuneate, again 3-lobed; lateral lobes unequally once or twice lobed, all lobes usually bristle-tipped: petioles 2–6 mm. long, with 2 glands at the base of the blade: peduncles surpassing the petioles: involucres wanting: calices about 2 cm. broad, greenish; sepals oblong, obtuse: corolla wanting: filaments of the crown shorter than the sepals: berries subglobose, about 1 cm. in diameter.

In sandy or rocky soil, Texas.

The species here described has been represented in herbaria for nearly fifty years. It is related to *Passiflora tenuiloba*, but the two species may easily be separated from each other by the leaves and the characters may be contrasted thus:

Middle lobe of the leaf-blades less than one-third as long as the nearly linear lateral lobes. *P. tenuiloba.*

Middle lobe of the leaf-blades as long as the cuneate lateral lobes or nearly so. *P. Bigelovii.*

The specimens cited below belong to the newly described species:

TEXAS: Camp Green, Oct. 30. C. C. Parry, Mex. Bound. Surv., no. 393c; Mountains and rocky places on the Pecos, Sept. 10, 1852, J. M. Bigelow, Mex. Bound. Surv., no. 393d; San Diego, 1884, Mary B. Croft, no. 64.

LEUCOTHOË ELONGATA.

A branching shrub 1–3 meters tall with puberulent or glabrate foliage. Leaves firm; blades oblong, elliptic, or sometimes oblong-oblanceolate or oblong-obovate, 2–5 cm. long, acute or slightly acuminate, serrulate, gradually or abruptly narrowed into short petioles: racemes 10–20 cm. long, quite slender: pedicels 1.5–3 mm. long, curved: calices usually puberulent; segments lanceolate, often narrowly so, 3–4 mm. long, acuminate, ciliolate, involute: corollas white or pinkish, 7–8 mm. long, cylindric, somewhat constricted at the throat; segments ovate, recurved: anthers with short subulate awns: capsules spheroidal, 3.5–4 mm. broad, much shorter than the calyx-segments.

In swamps and low pine lands, Florida. Spring.

The number of *Leucothoës* inhabiting the Atlantic seaboard and the Alleghenies must be increased to six. The species under consideration has hitherto been confused with *Leucothoë racemosa*. Specimens belonging here have been preserved in our herbaria for over fifty years. They may be segregated from specimens of *Leucothoë racemosa* by the elongated racemes and much longer, narrower and acuminate calyx-segments, which surpass the capsule. Besides these

characters the awns of the anthers are very short. The following collections are cited:

FLORIDA: "In paludosis, prope Tallahassee, Rugel, Mai, 1843;" Chapman, no. 119 and other unnumbered collections.

EVOLVULUS MOLLIS.

Perennial, silky. Stems branched at the base; branches ascending or decumbent, 5–20 cm. long, slender: leaves alternate; blades linear to linear-oblong or linear-lanceolate, 1–2.5 cm. long, acute, sometimes scythe-shaped, entire, sessile or nearly so; pedicels shorter than the calices: calices more or less densely lanuginose, 4–6 mm. long; segments oblong or lanceolate, 4–5 mm. long, slightly acuminate, erect or nearly so: corollas bluish, 10–14 mm. broad: capsules globose-ovoid, 4–5 mm. in diameter.

In dry soil, Texas. Spring and summer.

The separation of the above species serves as one step towards clearing up the chaotic conditions existing in various treatments of the genus *Evolvulus*. The species under consideration is related to *E. pilosus* and like that plant, it has both surfaces of the leaf-blades hairy. The characters by which the two species differ may be contrasted thus:

Pubescence shaggy: calyx-segments acute, erect or nearly so.	*E. pilosus.*
Pubescence silky: calyx-segments acuminate, tips spreading.	*E. mollis.*

I cite two widely distributed specimens:

Curtiss, N. A. Pl., no. 2178; calcareous prairies, near Dallas, Texas, May and June, collected by J. Reverchon.

Heller, Pl. S. Texas, no. 1912, Kerrville, Kerr county, June 19–26, 1894, altitude 485–600 meters.

DASYSTOMA BIGNONIIFLORA.

Perennial, glabrous. Stems erect, several dm. tall, branching rather slender: leaves opposite, relatively small; blades spatulate, 1–5 cm. long, acute, entire, narrowed into short petioles: pedicels longer than the calyx-tubes: calices surpassing the subtending petioles; tubes broadly campanulate; segments linear or lanceolate, acuminate, about as long as the tube, acute: corollas 3.5–4.5 cm. long, yellow: capsules elliptic-ovoid, nearly 1.5 cm. long, slender beaked.

In sandy soil, Tampa Bay, Florida. Summer.

The species above described is allied to *Dasystoma Virginica* but is less robust in habit. In the flower we find narrowly lanceolate and larger calyx-segments and much more elongated corollas which are quite suggestive of those organs in certain *Bignonias*. The original specimens were collected by Dr. Burrows, at Tampa Bay, Florida, in 1834. Specimens from Georgia collected by Dr. Boykin seem also to be referable here.

Physostegia leptophylla.

Perennial, from creeping or horizontal rootstocks. Foliage deep green, glabrous or nearly so below, puberulent above, especially in the inflorescence: stems erect or ascending, 6–10 dm. long, simple, regularly leafy to near the raceme, rather slender: leaves few; blades thin, oblong or some slightly broadest above or below the middle, obtuse or acute above, repand, narrowed into margined petioles; these ½ as long as the blades near the base of the stem, much shorter above or the upper pairs of leaves with sessile blades: racemes spike-like, 1–3 dm. long, slender, remotely-flowered: pedicels 1–3 mm. long, often as long as the bracts at maturity: calices 5–6.5 mm. long; tubes turbinate or campanulate in age, accrescent, somewhat inflated at maturity, faintly ribded, much longer than the pedicels; segments triangular to lanceolate, acute or acuminate, about ⅓ as long as the tube: corolla blue, about 2 cm. long; tube rather abruptly dilated just beyond the calyx, especially dilated beneath; lips about one-third as long as the tube: nutlets suborbicular, 3–3.5 mm. long, with sharp edges.

On river shores, peninsular Florida. Spring to fall.

This species is related to *Physostegia denticulata* and through it to *P. Digitalis* and *P. Virginiana*. Its diagnostic characters are indicated as follows:

Mature calices tubular, 9–11 mm. long; upper leaves conspicuously reduced. *P. denticulata.*

Mature calices campanulate, 5–6 mm. long; upper leaves only slightly reduced. *P. leptophylla.*

The original specimens were collected by Dr. A. P. Garber in the Manatee River, Florida, June, 1878 (So. Fla. Fl., no. 10). Specimens apparently referable to this species were collected many years ago by Dr. Chapman, no data, except Florida is recorded on the label.

Hedeoma serpyllifolia.

Perennial, softly hirsute. Stems tufted, ascending or decumbent, 1–2 dm. long, considerably branched, especially above the middle: leaves opposite; blades oval to oblong, 5–8 mm. long, obtuse, softly pubescent, entire, narrowed into manifest petioles: clusters 2–4-flowered: calices longer than the pedicels, 5–6 mm. long, hirsute; tube slightly constricted above middle, finely ribbed; teeth subulate; lower twice as long as upper: corolla bluish, 5 mm. long, only slightly longer than calyx; tube dilated above middle, minutely pubescent; upper lip rounded, minutely notched, smaller than the lobes of lower lips, the middle one of them larger than rest, deeply notched: nutlets 1 mm. long, puberulent.

In dry soil, Texas. Spring.

Specimens on which this species is founded have been referred to both *Hedeoma Reverchonii* and *H. Drummondii*, the latter however is so different that it need not be considered in this connection; it differs from *Hedeoma Reverchonii* in its widely spreading habit and the copiously divided branches. The leaves are only about one-half as large and more remote and their blades of an ovate or oval shape as compared with a narrowly oblong one. The calyx is only one-half as large and lacks the characteristic bristly pubescence of *H. Reverchonii*.

The original specimens were collected by Mr. Heller, at Kerrville, April 25–30, 1894, and distributed in his Plants of Southern Texas, no. 1663.

Hedeoma sancta.

Annual or biennial, finely cinereous-pubescent. Stems erect, 1–3 dm. tall, somewhat branched, rather slender: leaves opposite; blades oval, oblong, or narrowly oblong, 1–1.5 cm. long, entire, slightly revolute, narrowed into very short petioles: calices 5–6 mm. long, hispidulous, surpassed by the leaves; tube somewhat swollen; segments of the lower lips about twice as long as those of the upper: corollas 4–5 mm. long, puberulent; tube slender; upper lip and middle lobe of lower lip truncate or barely emarginate, other lobes rounded.

In dry soil, Texas. Spring.

Hedeoma sancta has heretofore been confused with the very rare *H. Drummondii*. In this connection it is interesting to note that there are only three specimens of the latter species in the Columbia University Herbarium, two of these are the Drummond specimens, and the third is Wright's number 463. The species just described differs in the more robust habit, in the larger broader and almost flat leaf-blades which conspicuonsly surpass the calyx and corolla. The species is founded on the following specimens:

TEXAS: San Antonio, April, 1853, *Dr. Geo. Thurber*; San Diego, 1885–86, *Miss Mary B. Croft*.

TEUCRIUM DEPRESSUM.

Apparently biennial, minutely pubescent with spreading hairs. Stems branched at the base; branches spreading or decumbent, 3–12 cm. long, leafy throughout, usually simple: leaves alternate; blades palmately 3-parted or sometimes 5-parted, 5–10 mm. long, sessile; segments entire or some, especially the middle one, toothed or incised: racemes narrow, spike-like, 1–6 cm. long: bracts similar to the leaves and only slightly smaller: pedicels 1–2 mm. long, stout: calices 3–4 mm. long; segments lanceolate, acuminate, longer than the tube, finely pubescent, with minute rigid tips, 1-ribbed, reticulated: nutlets fully 2 mm. high, coarsely wrinkled.

In dry soil, southern Texas. Spring.

Teucrium depressum is the smallest species of the genus within the limits of the United States; its nearest ally is *T. laciniatum*. Most of its organs are only one-half as large as those of its relative. The pubescence is coarser and more scabrous. Wright's number 1545, Coll. N. Mex., 1851–52, and Thurber's number 193 from El Paso, Texas, collected in April, 1851, both belong here.

PLANTAGO HELLERI.

Annual, dwarf, acaulescent. Foliage deep green, villous: leaves basal, rather numerous; blades linear, slightly broadened upward, or linear-spatulate, 2–12 cm. long, acute, entire, glabrate in age, except near the base, sessile: scapes solitary or several together, erect or ascending, villous:

spikes oblong-cylindrical, 1–2 cm. long, 8–10 mm. thick, conspicuous on account of the corolla-segments: bracts linear-subulate, surpassing the calices: flowers perfect: calices 4 mm. long, silky; segments broadly oblong or oval, the scarious margins much broader than the green midrib: corollas glabrous; tubes often barely as long as the calices; segments orbicular-ovate or suborbicular, spreading, as long as the tube: capsules oblong, 3–4 mm. long, included in the corolla-tube, circumscissile a little above the middle: seeds 1–2.

In dry soil, Texas. Spring and summer.

A species of the imperfectly understood *Plantago Patagonica* group: it is most closely related to *P. Patagonica lanatifolia*, but may be separated by the villous peduncles; the leaf-blades are glabrate, and large specimens may thus simulate *Plantago Wrightii*. The original specimens were collected by Mr. Heller at Kerrville, Texas, in April, 1894, distributed in Plants of Southern Texas, no. 1649.

Houstonia pulvinata.

Perennial, glabrous. Foliage turning black in drying: stems branched at the base; branches 8–12 cm. long, angled, densely tufted, forming cushion-like masses: leaves numerous; blades linear, 1–1.5 cm. long, acute, revolute, more or less curved, sessile: peduncles 1 cm. long or usually shorter: pedicels 1 mm. long or usually shorter, or somewhat longer at maturity, the cymes thus relatively dense: bracts minute, acute: calices about 1 mm. long, becoming 2 mm. long at maturity; segments triangular-ovate, acute: corolla bluish, 3.5–4 mm. long; tube gradually enlarged; segments oblong-ovate, about 1.5 mm. long, obtuse, pubescent within: capsules oblong-obovoid, fully 2 mm. long, slightly notched.

In sand, peninsular Florida. Summer. This species has always been merged in the composite *H. angustifolia*, but it possesses excellent distinguishing characters. The depressed cushion-like form it assumes in growing serves as a ready means of distinction. The short leaves, the congested cymes, the smaller corollas and shorter more obovoid capsules are sufficient to warrant its treatment as a species.

The original specimens are from St. Augustine, Florida,

where they were collected in 1876 by Miss Mary C. Reynolds and Dr. A. P. Garber.

Iva caudata.

Annual, hispid or somewhat strigose. Stems erect, 4–10 dm. tall, branching, ridged: leaves opposite or nearly so; blades ovate or elliptic, 4–10 cm. long, coarsely and irregularly serrate or incised, acuminate, acute to truncate at the base: petioles $\frac{1}{4}$–$\frac{1}{5}$ as long as the blades, bristly: spikes continuous or interrupted below, conspicuously bracted: bracts linear or with a narrowly elliptic base and linear tip, 7–15 mm. long, sparingly ciliate: heads drooping, sessile: bracts of the involucres cuneate, 3 mm. high, ciliolate: corollas 2 mm. long; segments spreading or recurved.

In swamps and low ground, Mississippi to Louisiana. Fall.

A characteristic species apparently confined to the Gulf States in the vicinity of the Mississippi River. It may be distinguished from *Iva ciliata* by the smoother foliage, the thinner leaf-blades and the conspicuously elongated linear bracts of the inflorescence. The following specimens are in the Columbia University Herbarium:

Louisiana: Swamps, September, *Wm. Carpenter;* New Orleans, 1835, *Dr. Ingalls;* 1838, *Dr. Riddell.*

Mississippi: Specimen in the Chapman Herbarium without further record.

New Southern Grasses.

By Geo. V. Nash.

Paspalum Chapmani.

Culms tufted, 8–10 dm. tall, smooth and glabrous: leaves on the culm about 3; sheaths loosely embracing the culm, the basal ones pubescent with short hairs, the remaining sheaths glabrous, excepting the pubescent margin, the upper 2 enclosing each a single raceme-bearing more or less exserted branch; ligule a brown scarious ring about 0.5 mm. wide, with back of it a dense ring of erect white hairs 2–3 mm. long; blades smooth and glabrous on both surfaces, the margins ciliate, the hairs arising from papillae, lanceolate to linear-

lanceolate, erect or nearly so, rather thin in texture. 0.7–2 dm. long, 7–14 mm. wide: racemes 10–12 cm. long, rather slender, the rachis flat, about 1 mm. wide, the main culm usually bearing 2 racemes, the branches but 1 raceme: spikelets in pairs, on shorter pubescent pedicels, oval, 2.2 mm. long and about 1.8 mm. broad; outer 2 scales membranous, densely pubescent with short spreading glandular tipped hairs, 3-nerved, or the second often 2-nerved by the suppression of the midnerve; flowering scale coriaceous, in cross-section triangular, the angles rounded; palet of similar texture.

Collected by Dr. A. W. Chapman in Florida, no detailed data. Distinguished from *P. ciliatifolium* by the broader densely pubescent spikelets and the pubescent margins of the sheaths.

Paspalum propinquum.

Culms tufted, 8–10 dm. tall, smooth and glabrous: leaves on the culm 2 or 3, scattered; sheaths loosely embracing the culm, the basal ones pubescent with short hairs, the remaining ones smooth and glabrous, the upper one much elongated and enclosing 1 or 2 concealed or more or less exserted raceme-bearing branches; ligule a brown scarious ring about 1 mm. wide; blades smooth and glabrous on both surfaces, ciliate on the margins with stiff hairs, the hairs arising from papillae, linear, erect or nearly so, 0.5–2 dm. long, 5–10 mm. wide, the midnerve light-colored: racemes rather slender, straight or curved, 8–12 cm. long, 1 or 2 on the long-exserted culm, the branches bearing a single raceme, the rachis about 0.8 mm. wide; spikelets in pairs, on shorter pubescent pedicels, oval, about 1.8 mm. long and 1.5 mm. wide, obtusely apiculate at the apex; outer 2 scales membranous, strongly pubescent with short spreading glandular-tipped hairs, the first scale 3-nerved, the second usually 2-nerved by the suppression of the midnerve which is very rarely present; flowering scale coriaceous, triangular in cross-section, the angles much rounded; palet of similar texture.

Collected by the writer in sandy soil at Eustis, Lake county, Florida, on July 25, 1894, no. 1427. It is closely related to *P. ciliatifolium*, but can be distinguished by the smaller densely pubescent spikelets with their obtuse apiculation.

Paspalum rigidifolium.

Whole plant, with the exceptions noted below, smooth and glabrous. Culms tufted, erect, 3–8 dm. tall: leaves on the culm 2 or 3; sheaths rather loosely embracing the culm, the basal softly pilose with rather long spreading hairs, the upper sheath usually enclosing a single more or less exserted raceme-bearing branch; ligule a scarious ring about 0.5 mm. wide, with a ring immediately back of it of long white hairs 2–3 mm. long; blades erect or ascending, rigid, linear-lanceolate, acuminate, 7–20 cm. long, 3–7 mm. wide: racemes straight, single, or rarely in 2's, 6–13 cm. long, the rachis about 1 mm. wide, flat: spikelets in pairs, on shorter glabrous or nearly glabrous pedicels, 2.3–2.5 mm. long, 1.7–2 mm. wide, oval or broadly obovate; outer 2 scales membranous, the first more or less pubescent with short spreading hairs, 5-nerved, the second 5-nerved, or sometimes 4-nerved by the suppression of the midnerve; flowering scale coriaceous, triangular in cross-section, the angles rounded; palet of similar texture.

In dry sandy soil, high pine land, peninsular Florida. Type collected by the writer at Eustis, Lake Co., May 1–15, 1894, no. 629; also at the same place on July 25, of the same year. no. 1419.

Diplachne Halei.

Whole plant, with the exceptions noted below, smooth and glabrous. Culms 6–10 dm. tall, flattened, finally branching; nodes 3–5: culm leaves 3–5: sheaths loose, longer or shorter than the internodes, compressed; ligule scarious, rounded at the summit, about 2 mm. long; blades erect or ascending, 1.5–4 dm. long, 6–12 mm. wide, flat, very rough on both surfaces and on the margins, long-acuminate, primary nerves 7–9: inflorescence finally exserted, 2–3 dm. long, 4–10 cm. wide, oblong, its axis and that of the numerous racemes very rough; racemes ascending, 4–7 cm. long: spikelets 4–6 mm. long, about 2 mm. wide, compressed, elliptic, on scabrous pedicels 1–2.5 mm. long: scales 7–10, lower empty 2 rough, 1-nerved, hispidulous on the keel, the subulate first scale about two-thirds as long as the much broader second which is usually slightly 2-toothed at the obtuse apex and about 2 mm. long; flowering scales about 3 mm. long, 1.2–1.4 mm. wide and elliptic when spread out, slightly and usually obtusely 2-toothed at the obtuse apex, the lateral nerves pilose for one-

third or less of their length, vanishing at or just below the margin, the midnerve glabrous, or pilose toward the base, the remainder, as well as the awn which is 0.2 mm. long or less, hispidulous; palet about as long as the body of the scale, the internerve about 0.75 mm. broad and elliptic when spread out, the infolded margins glabrous: stamens elliptic, 0.6 mm. long: grain (not quite mature) brown, about 1.5 mm. long, elliptic, compressed.

Marshes, Louisiana to Texas. Very distinct from the other members of this genus and readily recognized. The following specimens are referred here:

LOUISIANA: Hale, several sheets, the type in my own herbarium from the Gray Herbarium, labeled "*Leptochloa fascicularis* var."

TEXAS: Drummond, no. 322.

TRICUSPIS LANGLOISII.

Smooth and glabrous throughout, with the exceptions noted below. Culms tufted, 5–15 dm. tall, erect, round; nodes 2 or 3: basal leaves rather numerous, their sheaths crowded, equitant, and shining; culm leaves 2 or 3; sheaths coarsely striate, much shorter than the internodes, often pilose at the apex; ligule a ring of copious silvery hairs about 1 mm. long; blades erect or ascending, flat, sometimes folded when dry, glaucous and minutely pubescent on the upper surface, long-acuminate, the basal 2–4 dm. long and 2.5–5 mm. wide, the lower culm blade 7–15 cm. long and 2–3.5 mm. broad, the upper blade much smaller, 2 cm. or less long: panicle narrow, 1–2 dm. long, about 2 cm. broad, its triangular branches arranged singly, rarely in pairs, erect or nearly so, the larger 6–10 cm. long and usually subdivided: spikelets 6–7 mm. long, oval when mature, appressed to the branches, on stout pedicels about 1 mm. long: scales 6–8, the outer empty 2 acute, 1-nerved, or the second rarely 3-nerved, the first narrower than and about three-quarters as long as the second which is 3.5–4 mm. long; flowering scales elliptic, 3-nerved, the nerves excurrent as short points, pilose for the lower half with ascending hairs about 0.5 mm. long, the callus pilose, the lower scales about 4 mm. long and 2.25 mm. wide when spread out; palet as long as or a little shorter than the scale, 2-nerved, the nerves ciliate and about equally curved at the base and the apex, hence the internerve elliptic or

nearly so, about 1.6 mm. wide: grain flattened, oval, about 2 mm. long.

Dry sandy soil, Florida to Louisiana. The following specimens are referred here:

FLORIDA: A. W. Chapman, two specimens, one numbered 69.

MISSISSIPPI: S. M. Tracy, Biloxi, July 12, 1891.

T. H. Kearney, Jr., near Waynesboro, Oct. 2, 1896, no. 114.

LOUISIANA: T. Drummond, New Orleans, 1832.

A. B. Langlois, Slidell, "in pine woods clearings," October 5, 1891 (the type, in my own herbarium).

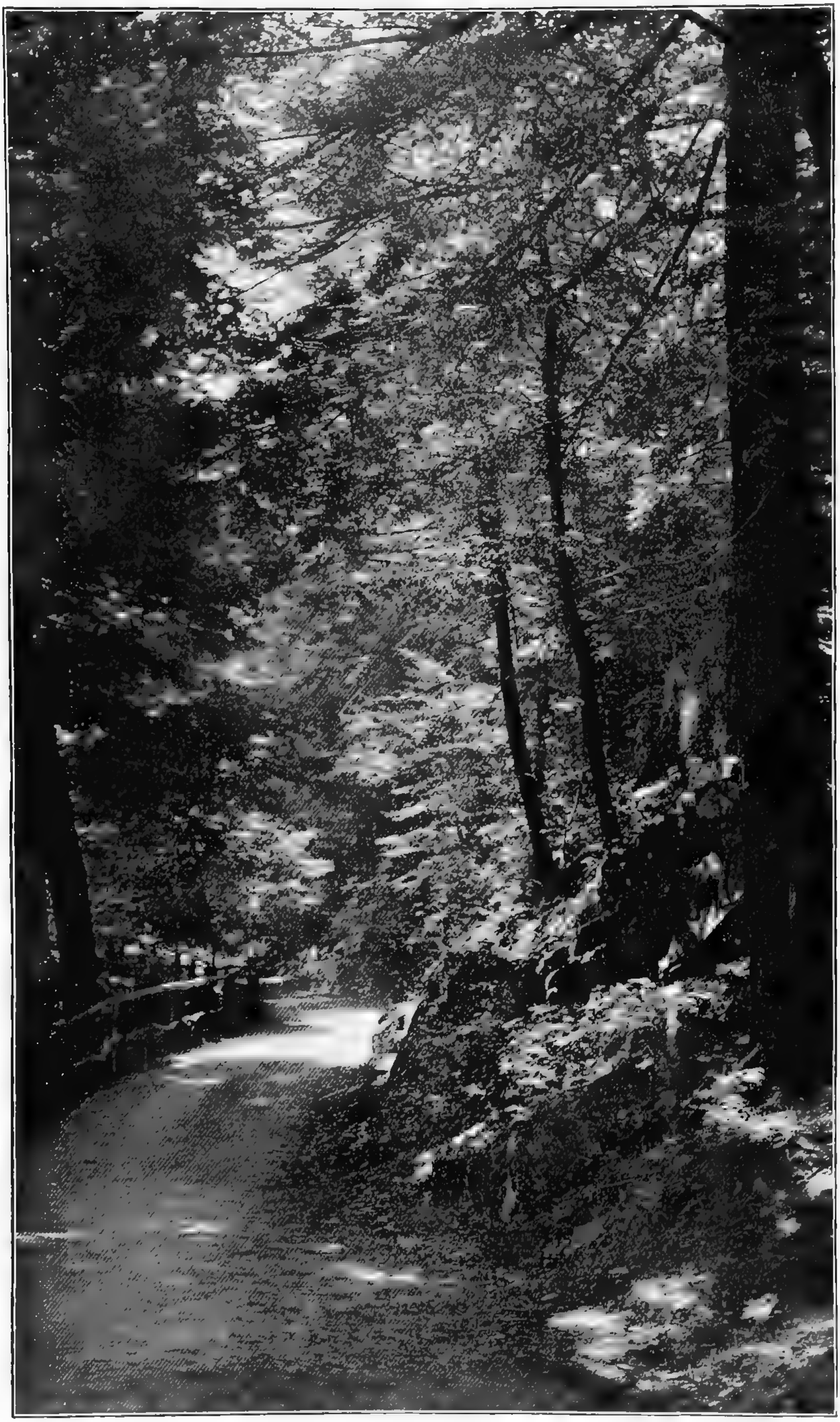
Related to *T. ambigua*, but quite distinct. In that species the panicle is more open, the spikelets smaller and broadly oval when mature, the flowering scales only about 3 mm. long, and the palet, in which lies the most marked difference, is only ciliolate on the nerves which are much more curved at the base than at the rounded and apiculate apex of the palet, the internerve therefore broadly ovate-oval. The nerves are decidedly gibbous at the base.

In the herbarium of Columbia University there are two sheets from Dr. Chapman labeled *Tricuspis ambigua*. The specimens on one of these belong to the above described new species; the other contains two specimens, one the herein described species and the other the *Poa ambigua* of Elliott. To this latter sheet is fastened a small pocket enclosing a few spikelets from Elliott's herbarium. This conclusively settles the identity of Elliott's species which Chapman cites in his Southern Flora. It will thus be seen that Chapman's idea of *Tricuspis ambigua* was a composite one, including both the *Poa ambigua* of Elliott and the species described above.

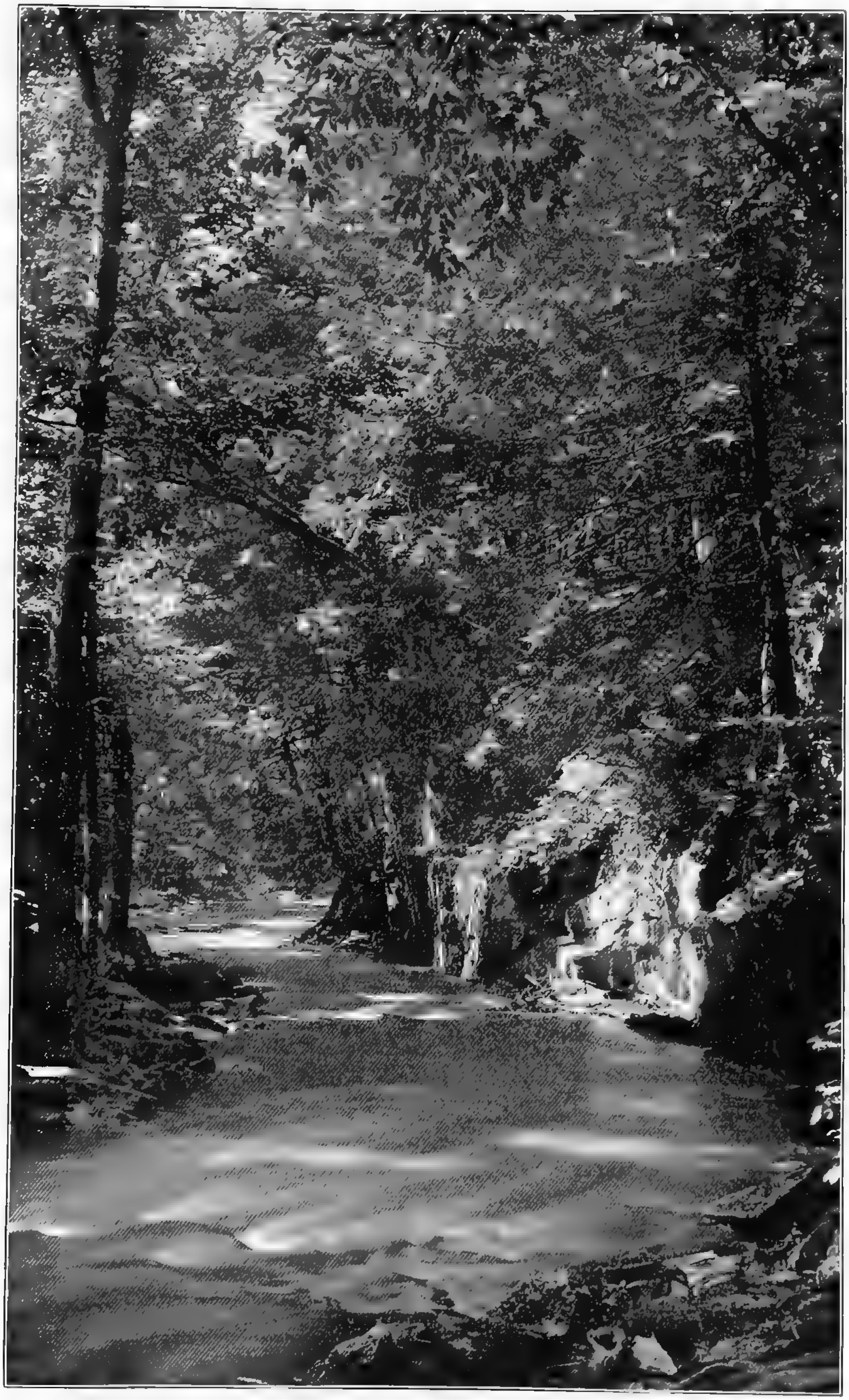
THE BRONX IN THE NORTH MEADOWS.

WEST SIDE OF HERBACEOUS GROUNDS, LOOKING NORTH.

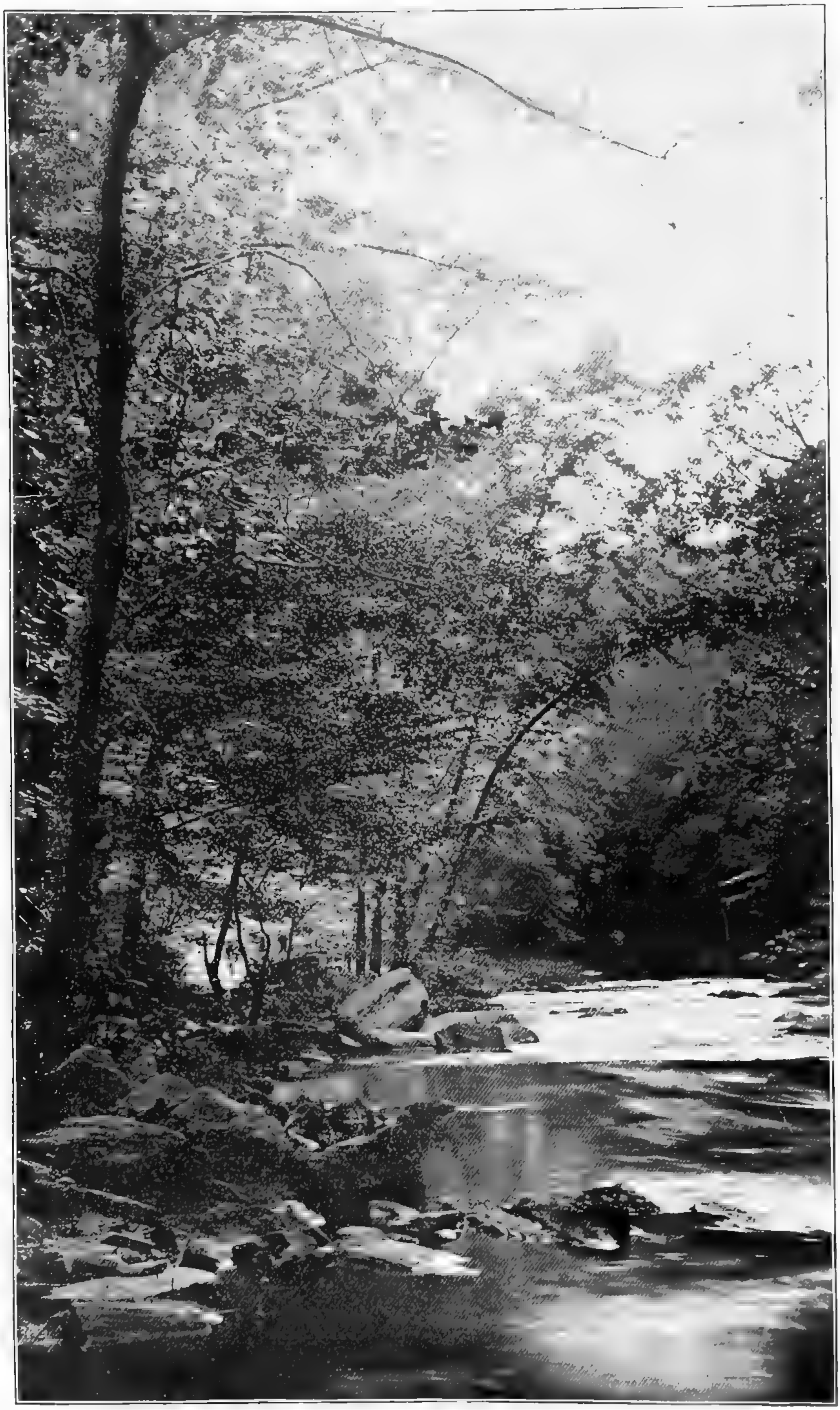
EAST SIDE OF HERBACEOUS GROUNDS, LOOKING SOUTH.



IN THE HEMLOCK FOREST.



THE GORGE OF THE BRONX.



THE BRONX BELOW THE GORGE.

VOL. I. NO. 5.

BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN.

CONTENTS:

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR 1899 (WITH PLATE 9),. 295
REPORT OF THE CURATOR OF THE MUSEUMS, ... 311
REPORT OF THE HONORARY CURATOR OF THE ECONOMIC COLLECTIONS, ... 322
REPORT OF THE ACTING LIBRARIAN, ... 325
REPORT OF THE DIRECTOR OF THE LABORATORIES, ... 331
REPORT OF THE HEAD GARDENER, ... 334
REPORT OF THE GENERAL ASSISTANT ON THE PLANTATIONS, . . 337
SCHEDULE OF EXPENDITURES DURING 1899, ... 397
REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND MEMBERS, 401
REPORT OF THE TREASURER, ... 412
REPORT OF THE SCIENTIFIC DIRECTORS,. 414
BOTANICAL CONTRIBUTIONS:
THE ROOTS AND MYCORHIZAS OF SOME OF THE MONOTROPACEAE, BY D. T. MACDOUGAL AND FRANCIS E. LLOYD (PLATES 10, 11, 12), ... 419
SOME NEW GRASSES FROM THE SOUTHERN STATES, BY GEO. V. NASH, ... 429
A NEW *Trisetum* FROM MICHIGAN, BY GEO. V. NASH, ... 437
THE GENUS *Bumelia* IN NORTH AMERICA, BY JOHN K. SMALL, . 437
DESCRIPTIONS OF NEW NORTH AMERICAN THORNS, BY N. L. BRITTON, ... 447

[ISSUED MARCH 30, 1900.]

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THE MUSEUM BUILDING, JANUARY, 1900.

BULLETIN

OF

The New York Botanical Garden

Vol. I. No. 5.

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF.

(*Submitted and accepted January 8, 1900.*)

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen: I have the honor to submit herewith my report as Secretary and Director-in-Chief for the year ending January 8, 1900:

Plants and Planting.

1. *Herbaceous Grounds.* The work of maintaining and increasing the herbaceous collection has been continued through the year with very gratifying results.

As shown by the list in the accompanying report of Mr. Nash, General Assistant, there have been 2,151 species and varieties, contained in 105 families, under cultivation during the season; this is a slight gain of species over the record for 1898.

Most of the accessions have been grown from seed in the nurseries, but a considerable number have been secured by exchange or purchase of roots. The general plan of the ground has not been changed, space for the additional plants brought in during the year having been provided by simply enlarging the existing plots. An additional pool for aquatic plants was excavated during the autumn.

This collection has been used by many students during the year and has now become complete enough to afford a good general view of all the natural plant families containing herbaceous species hardy in our climate.

The large number of different kinds of plants brought together on an area of about eight acres has naturally afforded a constant change in color effects from week to week as the plants successively came into bloom and this, together with the large amount of greensward between the plots and the forest surroundings of the glade, have made this plantation exceedingly attractive.

2. *Fruticetum.* During the planting season of both spring and fall, species of shrubs additional to those set out in the autumn of 1898 were installed on the plain northeast of the Museum Building. The collection of shrubs thus grouped in natural families now contains 338 species, which is a gain of 143 species over the record of 1898. The collection now contains enough kinds of shrubs to fairly represent all the natural families in which shrubs are included, hardy in this climate, and it has come to be of value to students, who have used it in considerable numbers.

The Salicetum or Willow collection has been installed on a part of the marshy ground northeast of the Fruticetum.

3. *Arboretum.* Tree planting in accordance with the scheme contemplated by the general plan has been carried on during both spring and fall. The number of species of trees now in place, including those native to the grounds or long ago established, aggregates 160.

4. *Viticetum.* The collection of vines which had been brought together in the nurseries was transferred during the spring and fall to the rustic arbor built last winter; the number of species now included in this collection is 45.

5. *Nurseries.* No additional space has been taken into the nurseries during the year, the amount of land already under cultivation having proved sufficient. Among the most important collections of seeds sown in the nurseries during the spring were those received from the Royal Botanical Garden at

Berlin, Germany, and from the Botanical Garden of Cambridge University, England. Through the interest of Mr. Rives we were able to purchase a large and interesting collection of Japanese shrubs from nurseries at Yokahama, Japan; these are still in the nurseries, but may be transplanted to the Fruticetum next year. A considerable number of them do not appear to have been grown in this vicinity hitherto, and their behavior in our climate is being noted with much interest.

6. *Boundary Borders.* The border screens have been considerably modified by addition and substitution, most attention having been paid to the strip along the railroad from the Southern Boulevard bridge to the Bog Garden, and to the strip near the stable and the Bleecker street entrance on the east side of the park.

7. *Temporary Greenhouse.* The use of the Columbia University greenhouse on Morningside Heights has been continued and it is now crowded with plants to its utmost capacity, there being probably enough specimens in this collection to occupy one-fifth or one-fourth the space which will be provided by the great range of horticultural houses now under construction.

Further details concerning the planting are contained in the report of Mr. Henshaw, Head Gardener, hereto appended.

Buildings.

Work on the contract of the Department of Parks with the John H. Parker Company, for the construction of the Museum Building, the Power House, Stable and Closet group, has been prosecuted throughout the year under the constant supervision of Commissioner Moebus of the Borough of the Bronx, his chief engineer, Mr. Daniel Ulrich, and his inspector, Mr. William Brooks, and under the direction of Mr. R. W. Gibson, architect, and his assistants.

Museum. The Museum Building is now essentially completed in accordance with the terms of the contract, it only remaining to effect the final cleaning up and the adjustment of some details relative to the furniture and the heating and

ventilating apparatus, to make the acceptance of the work desirable.

We have used several rooms of the Museum in a temporary way, the first specimens and books having been placed in one of the dark rooms upon the third floor, on August 15th, and portions of the Garden Herbarium were shelved in the Herbarium room, at the east end of the third floor, early in September. The transportation of the Herbarium of Columbia University to the new Herbarium room was begun on September 15th, and has been carried on at intervals since that time by means of our own teams and laborers, as opportunity afforded. It is now nearly completely installed, there remaining only a few boxes of specimens at the University. The Library room was first occupied on December 6th, and the moving of the Botanical Library of Columbia University into it was begun December 20th, and is now practically completed. The setting of the furniture in the laboratories was accomplished early in December, and the work of placing the instrumental equipment is now in progress. We have also occupied four of the basement rooms for storage. The cases in the Public Museum Halls are ready to receive specimens, and this work of installation may be begun within a few days. The lecture hall in the basement is quite ready for use whenever needed.

A supplementary contract for the construction of the Front Central Portico, amounting to $12,875, was awarded by the Commissioners of Parks to the John H. Parker Company, in July; work was begun under this contract immediately thereafter. This portico was completed in October, and accepted by the architect; it adds greatly to the appearance of the building.

Plans prepared by Mr. Gibson for some further ornamentation of the end pavilions of the Museum have been accepted by the Board of Managers, and Mr. Gibson has obtained some estimates of the expense which would be incurred in carrying them out, but he has concluded that it will be advantageous to defer this work for the present.

The Board of Managers have also authorized a sculptors' competition for designs for the fountain planned for construction in front of the Museum Building, and arrangements for such competition have been made by a committee of the Managers and the architect.

Power House.—Awaiting the completion of the Museum Building little work was done on the Power House early in the year, it having been essentially completed, with the exception of steam pipe and water pipe connections, last December; several tests of the boilers were made during the autumn, the official Police Department test having been made on November 3d. Steam was first turned on the Museum on December 15th and tests of the heating and ventilating apparatus have since been proceeding continuously; they are not yet fully completed.

Subway from Power House to Museum. In consultation with Commissioner Moebus, Mr. Ulrich and Mr. Gibson, it was deemed desirable early in the year to increase the height of the subway from 2 feet as originally planned, to 4½ feet along about one-third of its length, and a modification of the Parker contract to arrange for this was effected at an additional cost of $874. The subway was completed, its steam pipes laid, and the trenches closed early in the autumn.

Stable. As recorded in my last annual report this building was completed and was occupied by us in November, 1898; it has been in constant use ever since; a force-pump connecting with the well near by was placed in it early in December, affording an abundant supply of water.

Public Comfort Station. This structure is now complete for operation, needing only water and sewer connections, which it is planned to supply early in the year.

Tool House. No changes have been made in this building.

The Range of Horticultural Houses. As recorded in my last annual report, ground was broken for these buildings on January 3d under the contract awarded by the Commissioners of Parks to Mr. John R. Sheehan. Mr. Sheehan began ex-

cavations for the foundations early in the spring and has since prosecuted work continuously. In consultation with commissioner Moebus, Mr. Ulrich, Mr. Lincoln Pierson, of the Lord and Burnham Company, architects of these building, and with experts summoned by the commissioner and by the architects, it was deemed desirable to modify the contract so as to permit a strengthening of the girders of the large Central Palm House beyond that originally planned and also to add some columns in the two end houses of the range to give their roofs more certain support. It was also decided to be advantageous to substitute rubble masonry in the walls of the subway connecting the Power House with these buildings, and also in the walls of the trenches extending under the buildings, for the brick walls originally specified. After much consultation it was decided to allow Mr. Sheehan the sum of $2,000 extra on account of this modification, fixing the amount to his contract at $112,000 instead of $110,000, the considerable additional cost of the iron work being partially offset by the reduction effected in the change from brick to stone in the subway and trench walls.

The modification in the iron work caused a delay of three months in the framing of the central Palm Dome and this has only recently been completed; the other seven houses covered by the Sheehan contract are completed, including their glazing, with the exception of their interior fittings; work on these is being prosecuted.

The Propagating Houses. Detailed plans for the small greenhouses for propagating and experimental purposes, together with specifications, have been completed by the Lord and Burnham company and the buildings may be erected as soon as funds for the purpose become available.

Drainage and Sewerage. Early in the year it was deemed necessary to effect the connection of the Museum Building with the Williamsbridge and Bronx Park sewer, and beginning in March, a 12-inch vitrified pipe was laid from a point 25 feet in front of the west wing of the Museum down the steam subway trench for 140 feet, thus taking advantage of ex-

cavations already made, thence turning at right angles to the north and continuing to meet the position planned for the sewer from the Horticultural Houses, a manhole being established at this intersection; thence to the Williamsbridge and Bronx Park sewer at the curve of the latter just before it passes under the railroad, as provided in the general plan. The divergence from the general plan, by taking advantage of the subway excavations along this line enabled us to escape all rock excavations. From the starting point of the 12-inch sewer in front of the west wing of the Museum a 10-inch line was laid parallel with the front wall of the Museum nearly to the east wing; and all the outlet pipes from the Museum were connected with this 10-inch line under the Parker contract. To obtain the necessary grades and allow for future connections it was necessary to lay these sewers very deep, and the work was not finished until July.

In order to take care of the roof water of the Museum and the drainage from the Museum areas, a 10-inch vitrified pipe was laid in the bottom of the subway excavations from the west wing of the Museum to the main 18-inch land drain in the valley facing the railroad station; and also an 8-inch vitrified pipe from the eastern corner of the Museum to the ditch along the driveway leading to the lakes; this 8-inch line will ultimately be connected with the land drains of the driveway system which are planned to outflow into the lakes.

In order to take care of the roof water of the range of Horticultural Houses a 15-inch vitrified pipe was laid from the manhole built under the Sheehan contract just north of house number 5 for 220 feet to the northwest, temporarily outflowing on the surface; this may also be connected with the land drain system in the future.

The roof water of the Power House was made to flow into an 8-inch vitrified title connecting with a dry well 15 feet in diameter about 100 feet southwest of that building, and the blow-off water from the boilers as well as that which accumulates in the catch-pit of the Power House is discharged into this same dry well through a 3-inch vitrified pipe. The

drainage from the runways at the Power House is discharged through a porous tile system into the underlying gravel at a point 3 feet south of the northern retaining wall of the building.

During the autumn the porous tile drainage system begun last year north of the Bleecker street entrance on the eastern side of the Park was continued for several hundred feet, temporarily outflowing on the surface.

A system of 6-inch porous drain-pipe was also laid from a piece of swampy woods south of the nurseries to the east line of the Park, satisfactorily draining that part of the ground.

Water Supply. The Herbaceous Grounds were supplied with water in the spring by laying about 900 feet of 2-inch and 1-inch galvanized iron pipe from the branch provided last year in the pipe which supplies the Lorillard mansion. As these grounds only need water about four months in the year, this pipe was laid only about a foot beneath the surface and valves were supplied for shutting it off and draining it at will; hose taps were provided every 50 feet along its entire length. This water supply proved very useful during the extremely dry summer.

In August, during the building of the plaza facing the railroad station, all water pipes needed there were laid so as to avoid the tearing up of the road in the future, this policy having been adopted so far as it has been possible throughout the prosecution of the work of construction.

In September excavations were begun for the laying of about 4,000 feet of iron water pipe to connect the Power House and the Range of Horticultural Houses with the system begun last year by connecting the Museum building with the 36-inch aqueduct which passes through the Park. This work was prosecuted continuously and was finally completed toward the end of December; careful attention was paid to the grades, and fire-hydrants were placed on the two high points, one along the driveway just east of the Museum building and the other nearly in front of the eastern green house; these pipes were tested under high pressure before being covered.

The positions of all sewers, drainpipes and waterpipes laid have been carefully plotted on a map, as determined by actual surveys as the work progressed, so that there shall be no uncertainty about this important matter in the future.

Grading.

Grading operations have been for the most part confined to work in the immediate vicinity of the buildings, the surplus material being utilized for filling, in the preparation of the subgrades for roads and paths. All buildings have been made secure against winter storms by establishing slopes away from them sufficient to shed water.

The slopes about the Power House have been finished and planted and a temporary service road for coal delivery has been built from the rear of that building to the Southern Boulevard. The steep stone retaining wall at the south side of the Boulevard opposite the Power House has been masked by dumping earth against it so as to form a slope; this is not yet quite completed, but a few days work in the spring will finish it and thus remove a very unsightly and dangerous feature.

The terrace around the Museum Building is nearly completed, requiring only some shaping, top-soiling and sodding to finish it. The grading between the Museum building and the railroad station is well advanced and may be completed early in the spring in time for planting; the space planned for the fountain in front to the Museum has also been brought to approximately finished grade. Part of the filling required in building the two driveway approaches to the front of the Museum Building has been made, as well as a part of the excavation.

All this work of pipelaying and grading has been under the supervision of Col. F. A. Schilling, General Foreman since his appointment in July.

Considerable work remains to be done around the Museum Building before the final surfaces are secured, but as much of it is rock excavation, some progress can be made during the present winter.

The heaviest piece of grading in our plan is around the eastern end of the Range of Horticultural Houses in order to establish the desired surfaces. Work on this may proceed as opportunity offers.

Roads and Paths.

Under a contract of the Department of Parks with Mr. J. B. Devlin, awarded in June, by means of an appropriation voted by the Board of Estimate and Apportionment in 1897, work in road and path building was commenced early in July. This contract included the building of the plaza facing the railroad station, the building of the path between this plaza and the west wing of the Museum, the building of the path extending south from the east wing of the Museum to the driveway, and the filling necessary for the building of the driveway from the plaza southeast to where it crosses the aqueduct; the contract also included the construction of the necessary drain pipes and catch basins provided by the general plan. The work was continuously prosecuted and was completed early in December; it was very carefully inspected by Chief Ulrich and his assistants and is pronounced by experts to be one of the best pieces of Telford-MacAdam construction built in the city. The approximate cost was $14,000.

Two paths connecting those to the Museum wings built under the Devlin contract with the Museum basement doors are being built by us in the same general style, and we have made the subgrades and laid some of the foundation for part of the path planned to connect the station plaza with the Southern Boulevard.

By means of an unexpended balance on appropriations for the improvements of parks and parkways, Mr. Devlin was awarded another contract by the Commissioners of Parks in November; this contract provides for the building of driveways from the station plaza to the Southern Boulevard, and around the Museum Building as far as the lakes, together with the necessary accompanying drainage system, all as contemplated by our general plan, at a cost of about $20,000.

It is expected that work under this contract will be commenced early in the spring. A further balance to the credit of this appropriation remains, which may be utilized in additional road building.

Care of the Grounds.

Although the grounds have been visited by many thousand people no depredations worthy of serious attention have been committed. The plantations have been watched by the gardeners on Sundays and holidays in addition to the police patrol. The Hemlock Forest has been guarded by a keeper nearly throughout the season, who has also gathered up the papers and other refuse which still continue to be scattered by picnic parties, in spite of posted notices and verbal remonstrance, and this is the only nuisance that we have had to contend with; we do not know how to curb or control this vicious habit of people who are otherwise neat and orderly; the placing of receptacles for them to place refuse in has been seriously considered, but the experience elsewhere where this has been tried is not encouraging, inasmuch as it could not be enforced without filling the woods with guards.

Inasmuch as the picnicing of many more persons than those who have hitherto used the Grove for this purpose will be a menace to the natural undergrowth, and from the proximity of the tree-roots to the surface, a danger to the trees themselves, it now appears to me desirable to forbid picnicing in this forest. This will be no great deprivation to visitors, because there lies, just to the south, and on both sides of the river, over one hundred acres of forest land of the park, which might well be regarded as a pleasure grounds.

The grass of the tract was cut by our gardeners and laborers and stacked for fodder for our horses.

Lawn-mowers have been used immediately around most of the plantations.

The Surroundings of the Range of Horticultural Houses.

Plans for the detailed development of the grounds in the vicinity of the Range of Horticultural Houses have been ap-

proved by the Board of Managers and by the Commissioner of Parks of the Borough of the Bronx, during the year, after a prolonged study. They contemplate the building of a traffic road from the Southern Boulevard, near the Power House, west and south of these buildings near the line of St. John's College property to meet the Southern Boulevard again opposite the southern end of the Herbaceous Grounds, and also a park driveway, parallel with the traffic road and between it and the buildings, these two roads to take the place of the Southern Boulevard along its straight stretch between the Horticultural Houses and the Museum Building; also a carefully prepared system of path approaches to these houses and the necessary accompanying grading.

The Board of Managers has requested the Commissioner of Parks to apply to the Board of Estimate and the Municipal Assembly for an appropriation of $200,000.00 for the making of these improvements and for the completion of the Range of Horticultural Houses. The Commissioner has asked an opinion from the Corporation Counsel relative to the powers of the Board of Estimate in this connection, but this opinion has not yet been rendered.

There is no doubt that this is the most important new construction work in the development of the Garden, and the construction of at least one of these roads and of parts of the path system is almost imperatively necessary during the year.

Library.

Books for the Library, which had been accumulating in the temporary office since 1896 were moved into the Museum Building in August.

At the last Annual Meeting the Board of Managers authorized a subscription of $5,000 for the purchase of books, with special reference to works not in the Botanical Library of Columbia University. The sum was subscribed as follows:

Mr. Wm. E. Dodge	$1.000.00
Mr. D. O. Mills	1.000.00
Mr. Andrew Carnegie	1.000.00
Mr. J. Pierpont Morgan	1.000.00
Mr. Wm. C. Schermerhorn	500.00
Hon. Chas. P. Daly	100.00
Mr. Samuel Sloan	100.00
Hon. Addison Brown	100.00
Mr. C. F. Cox	100.00
Dr. N. L. Britton	100.00
	$5,000.00

Volumes aggregating 490 have been bought by means of this fund through an expenditure of $1,916.65. Under the appropriation for Library, 54 volumes have been bought, and 657 volumes have been received through gifts and exchanges, the total number of volumes added to the Library during the year being 1201, together with over 1250 pamphlets and parts. Considerable binding has been done.

The gift by the New York Academy of Medicine of 203 volumes of books from the library of the late Dr. David Hosack, is especially noteworthy. This collection includes many very rare works of the last century, now seldom to be obtained.

Special attention has been paid to obtaining agricultural and horticultural works, and many volumes have been secured through exchanges.

Mr. Nash, General Assistant, acted as Librarian during the first part of the year, and Professor MacDougal, First Assistant, has taken charge of the books since his appointment in July. The Scientific Directors have authorized the appointment of a regular librarian for 1900.

Museums and Herbarium.

The accumulation, preparation and mounting of specimens has proceeded continuously throughout the year. Over 70,000 specimens have been secured, mainly by gifts. Specimens mounted for the Herbarium aggregate the enormous number of 115,600, an increase certainly unprecedented in any American herbarium. A detailed account of the progress

of this part of our work will be found in the reports of the Curator of the Museums and of the Honorary Curator of the Economic Collections, herewith submitted.

Laboratories.

A large portion of the furniture necessary for the laboratory rooms is provided under the contract for construction and equipment of the Museum Building. Special cases may be added as required. Under an appropriation made by the Board of Managers, the obtaining of the instrumental equipment was begun in October, and sufficient has been secured to enable us to use some of the rooms for research purposes during the past two weeks. As stated in the report of the Director of the Laboratories, herewith submitted, twenty advanced students have already been given the advantages of the laboratories, library and collections of the Garden.

Lectures.

In coöperation with the American Museum of Natural History, two lectures were delivered in the lecture hall of that institution as follows:

April 13th, Professor L. M. Underwood, "The Royal Botanical Gardens at Kew, England."

April 6th, Professor H. H. Rusby, "The Production of Quinine."

Publications.

BULLETIN No. 4 was issued April 15, 1899. Four technical papers by members of the staff, published in the *Bulletin of the Torrey Botanical Club* have been reprinted for exchange purposes under the title "Contributions from the New York Botanical Garden." The printing of Vol. 1 of the Memoirs, containing Dr. P. A. Rydberg's "Annotated Catalogue of the Flora of Montana and the Yellowstone National Park," based on the collections made by Dr. Rydberg in 1897, by means of funds provided by Mr. Wm. E. Dodge, and authorized in 1898, is nearly completed, and this fine volume will be issued within a few weeks. The Board of

Managers and the Scientific Directors have also authorized the publication of a monthly journal, beginning January, 1900, and the first number of this journal is in press.

Temporary Office.

The house on Suburban street, Bedford Park, rented as a temporary office in November, 1898, has been since used continuously, and I deem it desirable to retain it until spring.

Botanical Exploration of Puerto Rico.

As recorded in my last annual report, Mr. and Mrs. A. A. Heller were sent to Puerto Rico, by means of funds provided by Mr. Cornelius Vanderbilt, to collect specimens illustrating the flora of that island. They returned in June, with nearly 8,000 specimens, and copious notes referring to them. A set of the herbarium specimens have been mounted for the purpose of determining the species, and some study has been given to them; the museum material secured is being arranged for exhibition; many duplicates were obtained which will be valuable for exchange purposes.

Supplementing this collection I have been able to examine the collections made about the same time in Puerto Rico by Dr. C. F. Millspaugh of the Field Columbian Museum of Chicago, who has also provided us with such of his specimens as were in duplicate, and I have recently secured through Professor Urban of the Berlin Botanical Garden, a considerable collection made some years ago on the island by Herr Sintenis. These collections, together with a set collected there in 1852 by Blauner, and contained in the Columbia Herbarium, together with a few specimens obtained by Wydler early in the century and our practically complete literature relating to the botany of the West Indies, will enable me, as opportunity offers, to prepare a moderately complete account of the flora. Mr. Heller purposes returning to Puerto Rico this winter to explore parts of the island unvisited by him on his former trip.

Mr. Henshaw spent about a month in Puerto Rico late in the winter by the aid of the same fund, and secured a desir-

able collection of orchids, ferns and other tropical plants, but he found the island far less desirable for horticultural exploration than either Trinidad or Jamiaca, owing to its being so largely under cultivation.

Meteorological Observations.

Under authorization by the Scientific Directors, instruments and apparatus have been ordered preparatory to recording the temperatures of the Herbaceous Grounds, the Fruticetum and the Hemlock Grove, and the rainfall in the Herbaceous Grounds.

Reports Appended.

I submit, also, reports by the Curator of the Museums and Herbarium, the Honorary Curator of the Economic Collections, the Director of the Laboratories, the Acting Librarian, the General Assistant, the Head Gardener, and a Schedule of Expenditures under appropriations made by the Board of Managers.

Respectfully,

N. L. BRITTON,

Director-in-Chief.

REPORT OF THE CURATOR OF THE MUSEUMS.

To the Director-in-Chief.

Dear Sir: I have the honor to submit herewith my report as Curator of the Museums and Herbarium for the year 1899:

Museums.

I. Museum Material.* During the early part of the year the accumulated material belonging to the Garden, derived from previous donations, exchanges, and purchases, and various more or less bulky objects accompanying sets of herbarium specimens, especially those of the Gibbes' collection, together with the museum specimens from Columbia University, now on deposit at the Garden, altogether making a total of over 2000 specimens, was carefully cleaned and thoroughly poisoned with mercuric chloride in order to prevent the ravages of insects in the future. These specimens will be largely available for exhibition purposes in the museums, and those not used in this way may be placed in the study collections.

1. *General collections.* During the spring, summer and fall the assistants and other members of the Garden staff spent all the available time in the field collecting specimens for use in the economic and systematic museums, the endeavor being to most thoroughly strengthen the exhibits of the food plants, drug plants, fiber plants, timber plants and poison plants for the economic museum, and the types to illustrate the natural families for the systematic museum. We were aided in this work by suggestions and various lists from Dr. Rusby, the Honorary Curator of the Economic Collections. Besides being useful for illustrating the products just mentioned, our local collections will serve to strengthen the exhibits of plants yielding essential oils, fixed oils, resins, gums, waxes, starch, glucose, sugar and plants of miscellaneous economic application, as an ample supply and duplicates were gathered

* See also tabulated appendix to this report.

whenever possible. In many cases sufficient quantities were collected for exchange purposes, and several botanists were supplied with laboratory material of desirable plants.

2. *Special collections.* Throughout the collecting season Mr. Wilson, of the staff, spent considerable time in addition to his regular duties in getting together an authentic collection of the mature seeds of the plants growing in the vicinity of the city, making each of his specimens much larger, and thus correspondingly more valuable, than is customary even in standard seed collections. Mr. Wilson has also made a local nut collection, in which are represented, by ample specimens, the various nuts native in the region about New York City.

II. PREPARATION OF MATERIAL FOR EXHIBITION. After an inspection of many museums, and various experiments and studies with the coöperation of the Director-in-Chief, the following apparatus was adopted for museum purposes:

1. *Cardboard boxes* of interchangeable sizes, for the temporary storage of exhibition material and the permanent reception of study specimens were secured in the following quantities and sizes:

Size of Boxes.	Number of Boxes.
2½ × 4 × 2¾ inches	203
1½ × 4 × 5½ "	207
2½ × 4 × 5½ "	204
1¼ × 5½ × 7¾ "	200
2½ × 5½ × 7¾ "	211
Total	1,025

This method furnishes both an orderly and convenient means of storage. On account of the unit system many boxes of the various sizes will pack neatly into a larger box or drawer. These boxes have been used to store many of the specimens referred to in the first paragraph of this report. Specimens too large to be cared for in this way have been wrapped in heavy paper and packed in wooden cases.

2. *Glass jars* for both exhibition and general storage purposes were selected with reference to their usefulness and

appearance. The style adopted is the *specimen jar, 2605*, made by Whitall, Tatum & Co. The following sizes and quantities were used for museum purposes during the year:

Diameter.	Height.	Number of Jars.
1½	2	39
1½	3	27
2	2½	27
2	3¾	39
2	5	57
2½	3½	27
2½	5	57
2½	7	57
3	4	39
3	6	67
3	8	93
3¾	6	87
3¾	8	84
3¾	10	75
4½	5	48
4½	8	90
4½	12	108
6	7	22
6	10	22
6	12	34
6	15	107
3½	18	29
5½	18	14
	Total,	1,242

These jars are adapted to both wet and dry specimens and have been used for all objects intended for exhibition purposes not stored in boxes referred to above or those mounted on cards as described below.

3. *Exhibition blocks* were adopted with reference to the display of specimens and their labels. The style of block selected is, in all cases, 1½ inches high, with beveled front, and a bead to hold the label; thus the label lies against the front of the block directly beneath the object to which it belongs; it stands out distinctly and in no way interferes with

the view of the specimen itself. We have already secured the following supply of blocks.

Number of Blocks.	Width.	Length.
147	1½ inches	1½ inches
128	2 "	2 "
125	3½ "	3½ "
125	4 "	4 "
125	4¾ "	4¾ "
111	5½ "	5½ "
203	7 "	7 "
26	6 "	12 "
25	6 "	18 "
25	6 "	24 "
25	12 "	12 "
25	12 "	18 "
25	12 "	24 "
Total, 1,115		

The blocks below 7 × 7 inches are made to accommodate the specimen jars referred to above, but they are equally well adapted to the display of dry objects not in jars. The larger sizes beginning with the block 6 × 12 inches increase by 6 inches in one or both dimensions and may be used for the more bulky specimens or extra large jars. The blocks are to be of a dead black color when finished; part of our supply has already been ebonized while the remainder is in preparation.

4. *Exhibition cards.* After a number of experiments, the best cardboard for displaying flat specimens of plants and photographs, plates and drawings was found to be 16-ply pearl-gray board, such as is used for making photograph mounts. This card soils less readily than other kinds and fades very slowly, as we have learned from both information and experiment. To supply our needs during the year the following quantities of these cards were purchased:

Number of cards.	Size of cards.	
400	7 × 11	inches
1950	11 × 14	"
150	14 × 16½	"
700	14 × 22	"
200	22 × 28	"

} General museum purposes.

300	13¾ × 18¼	"
Total, 3,000		

} Swinging frames for illustrating the flora within 100 miles of New York City.

On these cards have been mounted pressed specimens of the types of the natural families as far as we have been able to secure them for the systematic museum, also similar material to illustrate the derivation of various plant products for the economic museum.

Photographs, plates and drawings to accompany exhibits in the museums have been mounted on these cards and packed away with the plant specimens awaiting their installation in the museum cases.

5. *Illustration of the Flora of the Region within 100 miles of New York City.* About 624 species, represented by fully thrice as many specimens, consisting of both cryptogams and flowering plants, have been added to the already large accumulation of material to be used in the swinging frame display. More cryptogams have been set aside for this collection during the year than in any previous year. In addition to the plants themselves, over 100 plates representing species of the lower orders have been reserved for use in this local collection; these may be used temporarily for plants that we cannot get at once, or they may take the place of the actual plants in cases where these are of such a nature that they cannot be prepared for display.

6. *Labelling of Museum Specimens.* Early in the year it was decided that all museum labels should be printed by means of type and press. After Mr. Heller's return from

Puerto Rico his services were secured, and for the past six months he has been steadily at work printing labels for both the economic and systematic museums. Mr. Heller's combined knowledge of printing and botany made possible much larger and more accurate results than could have been otherwise obtained.

Herbarium.

1. *General accessions.** The year 1899 has witnessed a noteworthy increase in our herbarium material, the number of specimens received through donations and purchases aggregating about 70,000.

2. *Mounting and arranging of specimens.* At the close of last year 14,000 sheets of herbarium mounting paper remained unused, and during the year 67,000 sheets of mounting paper were purchased. The mounting of the year, as far as the Garden herbarium is concerned, was mainly confined to flowering plants and fungi, the number of miscellaneous cryptogams being relatively small. For the flowering plants and miscellaneous cryptogams 41,000 sheets were used, while for the fungi, chiefly those of the Ellis' collection, 18,200 sheets were used, making the total number of mounted herbarium sheets added to the Garden herbarium, 59,200. However, this does not represent the actual number of specimens added to our herbarium, for in the case of the fungi each sheet contains an average of three specimens, therefore the number of specimens mounted and arranged in the herbarium during the year amounts to about 95,600.

In addition to this, 8,500 sheets were mounted for the Columbia University herbarium now on deposit at the Garden. The sheets contain about 20,000 specimens and represent, for the most part, mosses and flowering plants. Thus the number of mounted sheets added to the herbaria at the Garden during the year amounts to about 67,700, while the number of specimens make a total of 115,600. Since the herbarium of Columbia University has been deposited in the new museum building, its congested condition has been re-

* See also tabulated appendix to this report.

lieved, and the sorting into their proper places of some 20,000 valuable specimens mounted several years ago, has just been finished.

Uses of the Herbarium. The herbarium has constantly been used by members of the Garden staff and officers and students of Columbia University for research work, for the comparing of specimens, for answering many inquiries of greater or less importance and in the prosecution of museum work. It has also been consulted by members of the staffs of other institutions in connection with critical work or various lines of research.

Collection and exchange of specimens. Members of the staff collected herbarium specimens during the spring, summer and fall both in the vicinity of the city and at more distant points, wherever they happened to be. In this way many specimens, some of especial interest, others new to science, were added to the herbarium, while several thousand plants have been labelled and placed in our duplicate herbarium for future exchanges. We have already derived a benefit from our duplicates in the form of exchanges with several institutions and individuals.

Museum and Herbarium Accessions.

Botanical Garden, Harvard University, plates, purchased,	44
Joseph Crawford, *Oxalis cymosa*, donated,.....	2
C. J. Hibbard, lantern slides, purchased,.....	21
E. E. Steele, plants from West Virginia, purchased,.....	230
E. E. Steele, plants from District of Columbia, purchased, ...	84
Myrtle Z. Hough, plants from Arizona, purchased,.....	140
H. E. Hasse, lichens from southern California, purchased,	200
H. E. Hasse, lichens from California, purchased,.....	117
United States National Museum, through J. N. Rose, *Tradescantia gigantea*, *T. humilis*, by exchange,.....	3
Spencer Moore, plants from Australia, purchased,.....	250
Joseph Crawford, miscellaneous herbarium specimens, exchange, ...	100
Charles Mohr, turpentine exhibit, purchased,.....	20

C. L. Pollard, photographic prints of vegetation of Florida Keys, purchased,..... 27
D. S. Johnson, photographic negatives, donated,..... 2
C. L. Pollard, plants from West Virginia, purchased,..... 90
W. N. Clute, plants from central New York, donated,... 191
W. N. Clute, plants from Mississippi, purchased,..... 90
W. N. Clute, museum specimens, donated,..... 3
N. L. Britton, herbarium specimens from New York, New Jersey, Pennsylvania and Ohio, donated,..... 627
Edw. Palmer, plants from Mexico, purchased,..... 472
A. Barta, nature-prints, purchased,..... 25
R. A. Plaskett, p'ants from Santa Lucia mountains, purchased, ... 165
T. F. Lucy, plants from western New York, exchanged,.. 200
W. R. Maxon, plants from central New York, purchased, 100
H. H. Rusby, plants from Bolivia, purchased,..... 1,000
F. S. Earle, plants from Colorado, purchased,..... 876
F. S. Earle, plants from New Mexico, purchased,..... 117
P. A. Rydberg, mounted herbarium specimens, purchased, ... 2,000
R. I. Cratty, Cyperaceæ, from Iowa, donated,..... 25
B. F. Bush, Missouri collection of 1898, purchased,..... 203
Wm. Trelease, plates of various plants, donated,..... 15
Albert Ruth, collection of 1898, purchased,..... 203
J. K. Small, hepatics, donated,..... 60
O. A. Farwell, *Rhus* from Michigan, donated,..... 6
International Paper Company, paper exhibit, donated,..... 40
Morris Coster, plate of *Dioscorea daemona*, and *D. pentaphylla*, donated,..... 1
P. Wilson, miscellaneous herbarium specimens, donated, 226
H. H. Smith, plants from United States of Colombia, purchased, ... 691
T. C. Porter, miscellaneous herbarium specimens, exchange, ... 211
Henry Troth, photographs purchased..... 6
Roland Thaxter, plates of parasitic fungi, donated,..... 20
G. Ramsperger, gums, donated,..... 10
C. F. Millspaugh, West Indian and Central American plants, exchange..... 264
Cornelius VanBrunt, negatives and lantern slides, purchased, ... 99

D. M. Andrews, plants from Colorado, purchased, ... 209
Northwestern Grass Twine Company, mats, cushions and cloth, donated,..... 15
W. W. Ashe, herbarium specimens, purchased, ... 400
A. A. Heller, plates of Hawaiian plants, donated,..... 25
Samuel Cabot, insulating quilt made of eel grass, donated, 1
Frank E. Fenno, plants from central New York, purchased, 600
Frank E. Fenno, *Ledum Groenlandicum*, donated,..... 1
L. T. Chamberlain, Sammlung deutscher Laubmoose, Lebermoose und Flechten, donated,..... 323
E. J. Hill, *Quercus ellipsoidalis*, donated, ... 4
S. M. Tracy, plants from Rocky mountains, purchased,.. 100
S. M. Tracy, plants from Mississippi, purchased,..... 414
S. M. Tracy, southern collection of 1899, purchased, ... 868
L. T. Chamberlain, Lichenes Amer. Sept., by Tuckerman, donated,..... 150
Marion S. Gibbes, miscellaneous collection, purchased,... 180
L. T. Chamberlain, plants from southern California and Massachusetts, donated,..... 880
Friedlander & Sohn, 3 books of Russian fungi, purchased, 300
Geo. F. Eaton, collection of *Sphagna*, purchased,..... 172
W. J. Beal, woody plants of Michigan, donated,..... 359
Cornelius Vanderbilt, Heller collection of Puerto Rican plants, donated, about 7,800
Cornelius Vanderbilt, photographic negatives of Puerto Rican vegetation by A. A. Heller, donated,..... 70
F. M. Hexamer, herbarium, donated, about 25,000
J. J. Crooke, herbarium specimens, donated, about..... 18,000
N. L. Britton, plants from Dutchess County, N.Y., donated, 107
B. G. Amend, drawings and plates by the late Professor Koehler, donated,. 250
Elmer D. Merrill, herbarium specimens, purchased,..... 175
M. Treub, photographs of vegetation in Java, donated,..... 21
H. E. Browne, herbarium specimens, purchased,..... 170
A. D. Selby, *Lactuca* from Ohio, donated,..... 2
C. C. Bruce, herbarium specimens, purchased,..... 450
Professor Morris Loeb, Japanese woods, donated, 1 volume
A. R. Ledoux, palm fruit, donated,..... 1
A. H. Curtiss, collection, series 4 and 5, plants from southern United States, purchased,..... 403

Dulau and Company, British Hieracia, purchased..... 34
C. H. Bissell, plants from Connecticut, donated,..... 330
J. K. Small, photographs of vegetation of Georgia, donated,..... 4
J. K. Small, lichens, donated,..... 40
O. A. Farwell, monocotyledonous bulbs, donated,..... 3
E. P. Bicknell, *Bryophyllum calycinum* from Bermuda, donated,..... 1
J. J. Crooke, copper plate of *Podophyllum*, from "Audubon's Birds of North America," donated,..... 1
Ezra Brainerd, *Rubus*, *Carex* and other species, donated,.. 31
W. C. Barbour, plants from northern Pennsylvania, exchanged, ... 68
H. M. Richards, museum specimens of algae, donated,... 12
P. Wilson, museum specimens, donated,..... 15
M. T. Cook, Marine algae, museum specimens,..... 10
T. C. Porter, *Razoumofskya pusilla*, from Pennsylvania donated,..... 1
C. D. Fretz, herbarium specimens of *Crataegus*, exchange, ... 10
G. J. Peirce, museum specimens of *Sarcodes*, donated,..... 1
C. D. Beadle, herbarium specimens of *Crataegus*, exchange, ... 22
O. D. Allen, museum specimens of *Cephalanthera*, purchased,..... 6
H. von Schrenk, museum specimens of *Razoumofskya* from Maine, donated,..... 4
Peter Henderson & Company, vegetables for economic museum, donated,..... 39
James Staples, fruits for economic museum, donated,..... 32
Parke, Davis & Company, specimens of drugs, donated,... 118
Peek & Velsor, specimens of drugs, donated,..... 38
N. L. Britton, plates of Lichens, donated,..... 100
L. M. Underwood, plates from various works, donated.. 350
Torrey Botanical Club, plates from Memoirs and Bulletins, donated,..... 25
Mrs. J. E. Humphrey, Nereis Boreali Americana, for museum plates, purchased,..... 1
L. M. Underwood, colored plates from Kunze's Farnkrauter, donated,..... 60

L. M. Underwood, colored plates from Bulliard's medicinal and poisonous plants of France, donated,.....	200
Frank Tweedy, herbarium specimens from the Rocky mountains, donated,.....	700
L. H. Lighthipe, herbarium specimens from Florida, donated,.....	180
R. S. McIntosh, photographs, donated,.....	9
Collected by the staff, about.....	5,400
Total,.....	74,273

Respectfully submitted,

JOHN K. SMALL,
Curator.

REPORT OF THE HONORARY CURATOR OF THE ECONOMIC COLLECTIONS.

To the Director-in-Chief.

Dear Sir: I have the honor to submit herewith my report upon work on the Economic Collections during the year 1899.

Work has been carried on in accordance with the plans submitted in my report a year ago.

Using Dragendorff's Economic Botany as a basis, a check list of the most important economic species of plants of the world has been compiled by Mr. Ringe. That part of this list which refers to the plants of the United States has been greatly extended, and, of more importance, greatly perfected in plan, by reference to an unpublished work on the economic botany of the United States, kindly loaned by the author, Dr. Valary Havard, U. S. A., now at Santiago, Cuba.

Special efforts have been made to complete the local collection of economic material, various members of the staff, more especially Messrs. Ringe and Wilson, having devoted such time to this work as could be spared from duties of more immediate importance. Owing to the great amount of time required for this form of collection a slight modification of the plan followed last year was employed. Instead of collecting a number of sets for exchange purposes, it was deemed best to concentrate effort upon a complete single set for our own shelves, deferring the collection of duplicates until another season. Owing to your consideration in allowing every possible opportunity for this work, and the energy displayed by the assistants, this collection is not only large and important, but so beautifully prepared as to promise a very attractive display in our cases. These collections comprise 525 specimens, representing 175 species.

A separate list was compiled of 43 species of poisonous plants of local occurrence. Of these about 100 specimens, representing 35 species, were collected with the same care which characterized the collection of the class last mentioned.

In the matter of foreign specimens, which are being especially collected for us, correspondence has been maintained with Mr. Herbert H. Smith, who is still collecting in U. S. Colombia.

In the way of exchanging, little has been done, as our material for this purpose is as yet scanty. With the practical completion of our own local collection, as above reported, we can, during the ensuing season, turn our attention more seriously to this work. We have received, however, from the New York College of Pharmacy, a considerable collection of drugs, for which return can be made in the future, as conconvenient. We have, moreover, sent to the Philadelphia Museums a large collection of botanical specimens, greatly desired for the building up of their herbarium, and for which they are prepared to return a large amount of valuable economic material as soon as a representative of the Garden can arrange to go and select it.

We are indebted to the following persons and firms for donations, some of them very extensive:

Messrs. Parke, Davis & Co. of Detroit and New York have donated 118 specimens of drugs.

Messrs. Peek & Velsor of New York have donated 36 specimens of drugs.

Messrs. Fritzsche Bros., the American representatives of Schimmel & Co., have donated a large and very valuable set of volatile oils and related products.

The Animal Trap Co., of Abingdon, Ill., has donated a set of woods of special value in the manufacture of traps, with samples of the traps made therefrom.

Messrs. Lanman & Kemp have donated two specimens of drugs.

We are specially indebted to the house of Peter Henderson & Co., of New York, and to Mr. James A. Staples of Marlboro, New York, not only for the specimens donated, but for their generous and interested coöperation in devising representative exhibits. The former donated 39 specimens of garden vegetables, the latter 32 specimens of domes-

tic fruits. In these classes, the aim has been to select such representatives of each kind as will most perfectly illustrate the parentage, simple or mixed, and the extreme variations of the article in respect to size, form, color and other qualities. All these specimens have been preserved in the formaldehyde solution and have kept perfectly with the exception of a few tints.

Other collections which are in progress of preparation for donation to us are as follows:

Messrs. Merck & Co. are preparing a large and very valuable collection representing the active constituents of plants.

Messrs. D. H. McAlpin & Co. are preparing a collection of tobaccos.

The Crude Rubber Co. is preparing a collection of crude rubbers.

Messrs. Clarence Lown & Co., of Poughkeepsie, N. Y., and the Rugg Manufacturing Co., of Greenfield, Mass., are preparing exhibitions of the special woods used in their wooden ware manufactures, and of the objects manufactured therefrom.

One rather extensive set of material pertaining to this class has been liberally donated by the International Paper Co., of this city.

Others promised or partly promised include an illustration of drug extracting by Messrs. Parke, Davis & Co., one of drug standardization by Messrs. Gilpin, Langdon & Co., of Baltimore, and one of medicated plaster manufacturing by Messrs. Seabury & Johnson.

Although it is not practicable to state at present the number of specimens ready to go into our cases, it may be said that they are sufficient to make a very creditable exhibit.

Respectfully submitted,

H. H. Rusby,

Hon. Curator.

REPORT OF THE ACTING LIBRARIAN.

TO THE DIRECTOR-IN-CHIEF,

Dear Sir: I beg to submit the following report on the library during the period ending January 1, 1900:

Since the assumption of my duties in connection with the library, July 1, 1899, Mr. Nash having had general charge of the books during the first half of the year, attention has been chiefly directed to completing the files of agricultural and horticultural publications. This was done chiefly by exchange, though many important donations have been made. A printed list of the desiderata and duplicates was used to great advantage in the correspondence upon such matters.

Perhaps the most notable donation in the way of books is that of the New York Hospital, embracing the botanical library of the late Dr. Hosack, containing about 205 volumes, the majority of which are extremely valuable and many are quite rare. The total list of accessions is given below.

A design for a book plate by Robert W. Gibson, architect, has been accepted by the Board of Managers, and suitable dies from the same have been prepared. The work of pasting the copies of the plate in the books was begun early in December and is nearly completed.

The library of the Garden was moved from the temporary office on Suburban Street to the physiological dark room in the museum, August 15th, and was placed on the shelves in the stack room, December 6th. The botanical books of Columbia University are now deposited in the stack room in accordance with the agreement between the two institutions. The transportation of these books was begun December 20th and practically completed December 28th, 1899.

ACCESSIONS.

	Complete Volumes.	Parts and Pamphlets.
Purchased under appropriation for library,	54	78
Purchased by special Book Fund,.....	490	
Donated, New York Hospital, from botanical library of the late Dr. Hosack,	205	
Given by N. L. Britton,.....	6	290
" Mrs. E. G. Britton,.....		10
" Samuel Henshaw,.....	8	
" J. S. Merriam,.....	24	25
" R. S. Brownne,.....	10	
" D. T. MacDougal,.....	34	42
" Miss A. M. Vail,.....	4	8
" C. L. Allen,.....	6	
" Minnesota Horticultural Society,	32	
" Geological and Natural History Survey of Minnesota,.....	33	
" Indiana Horticultural Society,..	11	
" Bussey Institution,.....	6	
" Department of Agriculture of Canada, ...	8	
Prof. W. J. Beal, by exchange,.....	70	
By exchange with the institutions named below, about,.....	200	800
	1201	1253

List of Exchanges.

Institutions.

Illinois State Laboratory of Natural History, Urbana, Ill.
N. Y. State Museum of Natural History, Albany, N. Y.
Eli Lilly & Co., Indianapolis, Ind.
American Museum of Natural History, New York City.
Smithsonian Institution, Washington, D. C.
U. S. Department of Agriculture, Washington, D. C.
Office of Experiment Stations.
Division of Agrostology.
" " Botany.
" " Soils.
" " Pathology and Physiology.
Weather Bureau and its 44 sectional departments.

Geological Survey of Maryland, Baltimore, Md.
Geological and Natural History Survey of Minnesota, Minneapolis, Minn.
U. S. Geological Survey, Washington, D. C.
Kew Gardens, London, England.
Botanical Department, Jamaica, West Indies.
Jardin Botanique, Geneva, Switzerland.
Botanical Garden, Trinidad, West Indies.
Missouri Botanical Garden, St. Louis, Mo.
University Library, Upsala, Sweden.
Denison University, Granville, Ohio.
Königl. Bot. Museum, Berlin, Germany.
Field Columbian Museum, Jackson Park, Chicago, Ill.
Royal Botanic Garden, Sibpur, near Calcutta, India.
Agricultural Experiment Station, Auburn, Ala.
" " " Uniontown, Ala.
" " " Tucson, Ariz.
" " " Fayetteville, Ark.
" " " Berkeley, Calif.
" " " Fort Collins, Colo.
" " " New Haven, Conn.
" " " Storrs, Conn.
" " " Newark, Del.
" " " Lake City, Fla.
" " " Experiment, Ga.
" " " Moscow, Idaho.
" " " Urbana, Ill.
" " " Lafayette, Ind.
" " " Ames, Iowa.
" " " Manhattan, Kans.
" " " Lexington, Ky.
" " " Audubon Park, New Orleans, La.
" " " Baton Rouge, La.
" " " Orono, Me.
" " " College Park, Md.
" " " Amherst, Mass.
" " " Agricultural College, Mich.
" " " St. Anthony Park, Minn.
" " " Agricultural College, Miss.

Agricultural Experiment Station, Columbia, Mo.
" " " Lincoln, Nebr.
" " " Reno, Nev.
" " " Durham, N. H.
" " " New Brunswick, N. J.
" " " Mesilla Park, N. Mex.
" " " Geneva, N. Y.
" " " Ithaca, N. Y.
" " " Raleigh, N. C.
" " " Fargo, N. D.
" " " Wooster, Ohio.
" " " Stillwater, Oklahoma.
" " " Corvallis, Oregon.
" " " State College, Pa.
" " " Kingston, R. I.
" " " Clemson College, S. C.
" " " Brookings, S. D.
" " " Knoxville, Tenn.
" " " College Station, Texas.
" " " Logan, Utah.
" " " Burlington, Vt.
" " " Blacksburg, Va.
" " " Morgantown, W. Va.
" " " Madison, Wis.
" " " Laramie, Wyoming.

Central Experiment Farm, Ottawa, Canada.
Brooklyn Institute of Arts and Sciences.
Botanic Garden, Cincinnati, Ohio.
New York Public Library.
Smith College, Northampton, Mass.
University of Wisconsin, Madison, Wis.
Victoria Gardens, Bombay, India.
Royal Botanic Garden, Glasnevin, Dublin, Ireland.
Columbia University Library.
Botanical Garden of the University of Siena, Italy.

Journals.

Beihefte Botanischen Centralblatt, Cassel, Germany.
Botanical Gazette, University of Chicago, Chicago, Ill.
American Monthly Microscopical Journal, Washington, D. C.

Vick's Monthly, Rochester, N. Y.
Pharmaceutical Record, New York City.
Meehan's Monthly, Germantown, Pa.
Revue Bryologique, Cahan, Athis, France.
Notarisia, Venice, Italy.
Nuovo Notarisia, Jardin Botanique, Padua, Italy.
Botaniska Notiser, Lund, Sweden.
Erythea, Berkeley, Calif.
American Gardening, New York City.
American Journal of Pharmacy, Philadelphia, Pa.
The Plant World, Washington, D. C.
Journal of Pharmacology, New York City.
Bulletin of Pharmacy, Detroit, Mich.
Pharmaceutical Review, Milwaukee, Wis.
Gardening, Chicago, Ill.
The American Florist, Chicago, Ill.

Societies.

New York Academy of Sciences.
Torrey Botanical Club, New York.
California Academy of Sciences, San Francisco, Calif.
Connecticut Academy of Arts and Sciences, New Haven, Conn.
Davenport Academy of Sciences, Davenport, Iowa.
Kansas Academy of Sciences, Topeka, Kan.
Appalachian Mountain Club, Boston, Mass.
Massachusetts Horticultural Society, Boston, Mass.
St. Louis Academy of Natural Sciences, St. Louis, Mo.
Elisha Mitchell Scientific Society, Chapel Hill, N. C.
Natural Science Association of Staten Island, New Brighton.
New York Microscopical Society, Flatbush, N. Y.
Cincinnati Society of Natural History, Cincinnati, Ohio.
Academy of Natural Sciences, Philadelphia, Pa.
Pennsylvania Forestry Association, Philadelphia, Pa.
Wisconsin Academy of Arts and Sciences, Madison, Wis.
Edinburgh Botanical Society, Edinburgh, Scotland.
Societe Botanique "Dodonea," University of Ghent, Belgium.
K. K. Zoöl. Bot. Gesellschaft, Vienna, Austria.
Societe Botanique, Luxemburg, Belgium.
Societe Botanique, Brussels, Belgium.
Botanischer Verein, Landshut, Baiern, Germany.

Sociedad Broteriana, Jardin Bot., Coimbra, Portugal.
Sociedad Cientifica Argentina, Buenos Ayres, La Plata, S. A.
Rochester Academy of Sciences, Rochester, N. Y.
Philadelphia Mycological Center, Philadelphia, Pa.
Naturforschende Gesellschaft, Zurich, Switzerland.
Buffalo Society of Natural Sciences, Buffalo, N. Y.
Minnesota Horticultural Society, Minneapolis, Minn.
Indiana Horticultural Society, Indianapolis, Ind.

Respectfully submitted,

D. T. MacDougal,
Acting Librarian.

REPORT OF THE DIRECTOR OF THE LABORATORIES.

To the Director-in-Chief:

Dear Sir: I have the honor to submit the following report for the period ending January 1, 1900

Upon the assumption of my duties July 1, 1899, attention was turned to the organization and equipment of the laboratories. The space placed at my disposal included thirteen rooms, which have been designated for special purposes in such manner that a storage room, preparation room, and constant temperature chamber are provided on the ground floor of the Museum Building, and an embryological laboratory, morphological laboratory, office, class room, physiological laboratory (skylighted), physiological dark room, chemical preparation room, chemical laboratory, photographic operating and balance room, and photographic dark room are on the third floor.

Every student in the institution has some special problem under investigation, and the apparatus purchased has been secured for meeting the individual needs of these workers; a plan which will be followed in all additions to the equipment, and which makes the provision and duplication of demonstration and illustrative material unnecessary. Designs have been made for several pieces of apparatus made necessary by this method of procedure, and some of these are now in process of construction. The following instruments, apparatus and material have been purchased by means of an appropriation made by the Board of Managers:

Three Bausch and Lomb compound microscopes, complete with 1/12 inch oil immersion lens; 3 compound microscopes, Leitz, complete, with 1/12 inch immersion lens; 3 B. and L. dissecting microscopes; 2 paraffine baths, complete; 1 torsion balance; 1 microchemical scale; 1 Jung microtome, complete with all accessories; 1 Jewell water still, No. 1; 1 New York photographic studio outfit, complete; 1 telephoto cycle Poco camera with Goerz lens, Ser. III., together with a set of dark room and general pho-

tographic accessories, thermometers, micrometers and general microscopical accessories, culture dishes, dissecting tools, stains, chemical reagents, dishes, and the general glass and metal ware necessary for the operations of students.

The following graduate students have carried on work in connection with the institution, or have had the privileges of its collections and library.

Names of students registered at the Garden are starred(*). The remainder are registered graduate students at Columbia University and allied schools.

* Howard J. Banker, A.B., Syracuse University, 1896.
May Banta, B.S., Wellesley College, 1889.
* Anna Priscilla Braislin, A.B., Vassar College, 1897.
Robert Allyn Budington, A.B., Williams College, 1896; A. M., 1899.
Louise Brisbane Dunn, A.B., Barnard College, 1897; A.M., Columbia University, 1899.
Elon Howard Eaton, A.B., Rochester University, 1890; A.M., 1893.
William King Gregory.
David Griffiths, B.S., Agricultural College, South Dakota, 1892; M.S., 1893.
* Sara H. Harlow, A.B., Wellesley College, 1891.
Roland McMillan Harper, B.E., University of Georgia, 1897.
Tracy Elliot Hazen, A.B., University of Vermont, 1897.
* Nellie Priscilla Hewins, B.S., Cornell University, 1898; Graduate student, Cornell, 1898–99.
William Erksine Kellicott, Ph.B., University of Ohio, 1898.
* Joseph Edward Kirkwood, A.B., Pacific University, 1898; Graduate student, Princeton, 1898–99.
Francis Ernest Lloyd, A.B., Princeton University, 1891; A.M., 1895.
Paul Marshall Rea, A.B., Williams College, 1899.
* Rosina J. Rennert, A.B., Normal College, 1897.
George Gilmore Scott, A.B., Williams College, 1898; A.M., 1899.
John Cutler Torrey, A.B., University of Vermont, 1898.
Ada Watterson, A.B., Barnard College, 1898.

Total number..... 20

During the season lectures have been delivered at the marine biological laboratories at Cold Spring Harbor and at Wood's Hole, in addition to attendance upon several scientific meetings. A piece of investigation upon Symbiosis and Saprophytism has been completed and published in the bulletin of the Torrey Botanical Club for October, 1899, which has been reprinted as No. 1 of the Contributions from the New York Botanical Garden. Various other technical and popular articles have been written for other periodicals. An introductory text-book on botany, entitled "Nature and Work of Plants," has been prepared and is now in press with the Macmillan Company.

Respectfully submitted,

D. T. MacDougal,
Director of the Laboratories.

REPORT OF THE HEAD GARDENER.

To the Director-in-Chief.

Dear Sir: I have the honor to submit the following report as Head Gardener for the year 1900:

Over four thousand packets of seeds, obtained mainly from other botanical gardens, have been sown in the nurseries, and the result has been very satisfactory, particularly in shrubs; many of these are still in nursery rows, while some have been used in filling up gaps in the Fruticetum and in the permanent boundary borders. The plants raised from the seeds of hardy herbaceous plants were set in the Herbaceous Grounds, and to help make a show along the borders. There has been no unnecessary propagation of plants that could not be used advantageously in the future.

In the spring a strip was plowed and prepared along the western or railroad border, and in an "off-hand" way sown with showy annuals and supplemented by surplus from the seed beds; this produced a brilliant effect within a very short time, and was a public educator on the use of annuals for immediate effect in economical planting.

The old reaches and lagoons of the Bronx River are peculiarly well adapted to the cultivation of aquatics, needing very little excavation and preparation to produce unrivalled homes for these interesting plants. We have succeeded in establishing a considerable number already, especially the Nelumbos, and some of the water-lilies, which will never need replanting if the muskrats leave them alone.

The Fruticetum is already beginning to show the result of taking advantage of one of the old level plains of the Bronx Valley; representatives of nearly all the natural families containing hardy shrubs are in place, and additions can readily be made as fast as material comes to hand: the work has been accomplished very economically, most of the plants being seedlings raised in the nurseries. No fertilizers have been required, the natural top-soil being rich enough for a

start, and, I may add, this holds good for the whole of the tract devoted to planting.

The Arboretum planting has been continued, and here the tract is so rich in specimens of native trees that in many places they need only accentuating with younger plants to fill up the sequence.

Under our contract with the Department of Parks the whole of the Hemlock Forest, as well as the woodlands adjacent has been untouched, except for the removal of a few dead trees, as agreed upon by us and the Department of Parks, pursuant to the contract, and the gathering up of refuse left by visitors. The Grove is unique, and could not be improved.

During the grading operations about the buildings, and in the construction of roads and paths, all the top-soil has been husbanded, wherever possible, for the final ornamental planting. This has had to wait upon the road and path building and the necessary accompanying grading. The completion, late in the autumn of the plaza facing the railroad station and of the lateral path approaches to the Museum, made it possible to commence this work in November.

Awaiting the completion of the Horticultural Houses, many fine specimens of tender plants are crowded into the greenhouses at Columbia University, and others are temporarily cared for in the basement of the Museum Building; many others offered us have been refused for want of space to accommodate them.

The Herbaceous Grounds are already a delight to the eye, and a public educator; the stream running through them has been taken advantage of, and in several places widened out into lagoons, in which are grown aquatics related to the nearby upland plants; this water system may now be made practically complete by excavating for the small lake planned at the southern end of the glade, as much for landscape effect as for water plants. The rocky boundary on the south is already occupied by a fern garden, and this may be added to as rapidly as time and material will allow.

During the autumn several acres of the marshy portions of

the north meadows, reserved for Bog Gardens were cleared and the ground occupied by the primary planting of willows and poplars. We will call this tract hereafter the Salicetum.

The Viticetum arbor, built of rough logs cut on the grounds is planned to be the home of all climbing plants hardy in this latitude, and occupies a site to the west of the Hemlock Forest. As far as the plants could be procured this has been planted and cared for during the season.

All plants of the Herbaceous Grounds, Fruticetum, Arboretum and Viticetum have been carefully mulched during the early winter.

Respectfully submitted,

SAMUEL HENSHAW,
Head Gardener.

REPORT OF THE GENERAL ASSISTANT.

To the Director-in-Chief.

Dear Sir: I have the honor to submit herewith my report as General Assistant upon the various systematic plantations under my care during the past year. An account of the progress made in each tract is given below, and at the end of this report will be found appended detailed lists of the plants growing in each, and also a list showing the total number of families under cultivation; in each family the number of genera is indicated and the number of species in each genus. A list of accessions of plants and seeds is also appended.

Herbaceous Grounds.

A number of the beds have been enlarged and ten new ones added to those already existing, making a total of 123 beds in the tract. There have been grown here during the year plants representing 104 families, 674 genera, and 2084 species and varieties. A number of those of the preceding year failed, the vines and trailers hitherto grown here were transferred to the viticetum, and the growing of some of the obnoxious annuals was dispensed with. This materially decreased the number cultivated in this tract, but it has more than been offset by the new ones secured from other sources, largely obtained from seeds secured in exchange with the Botanic Gardens at Cambridge, England; Berlin, Germany; and Smith College, at Northampton, Mass.

In the matter of labeling considerable has been accomplished. Family signs, indicating the common and botanical names, have been placed in all the beds and lagoons, requiring 128 for the purpose. Additional individual labels to the number of 845 have been made and placed in position.

Fruticetum.

(Including the Salicetum.)

A number of the beds have been enlarged and several new ones added, necessitated by the addition of species new to

the collection, which now numbers 47 families, represented by 114 genera which include 330 species and varieties.

Family signs have been placed in all the beds, 56 being necessary. The species and varieties have also been labeled, the label used being similar to that in the Herbaceous Grounds, but larger. With few exceptions, two have been made for each species or variety, making a total of 490.

Although for some time there have been a number of willows and poplars in the nursery collection, opportunity was not afforded until this fall of opening up the Salicetum. There are now in place in it 4 species of poplars and 14 species and varieties of willows.

Arboretum.

(Including the Pinetum.)

A number of trees native to the grounds have been labeled. The label used will be alluded to below. In addition to the above, trees scattered in various parts of the grounds have been similarly labeled. These are mainly located along the road running eastward from the depot, in the borders of the Herbaceous Grounds, and along the road running from the Southern Boulevard northward and thence across the Blue Bridge to the stable. About 200 of these labels all told have been manufactured and attached to the trees. This tract contains trees, either native or planted, representing 32 families, 56 genera, and 160 species and varieties.

The young trees in the Pinetum have been labeled with the same style label used in the Fruticetum, and about 25 have been placed in position.

Viticetum.

The beds along the arbor, which was finished early in the year, were planted during the spring and summer with vines. There are at present in this tract 45 species and varieties, representing 17 families and 23 genera. It is hoped next year to materially increase the representation in this plantation. As yet no attempt has been made to place show

labels in this collection, the plantations more accessible and more frequently visited by the public being first equipped.

Nurseries and Borders.

The trees and shrubs in the various nurseries have been gone over this fall and all missing labels replaced. During the summer and fall a large number of plants have been transplanted to the various plantations. The larger number of these went to the Herbaceous Grounds, and were mainly derived from seed obtained from the botanic gardens at Cambridge, England; Berlin, Germany; and Smith College, at Northampton, Mass.

In the collection of herbaceous perennials skirting the west border about 250 show labels were put in. These labels were similar to those used in the Herbaceous Grounds.

In the various nurseries and borders there are plants representing 45 families, 102 genera, and 413 species and varieties unrepresented in the other plantations. A large number of these will be in condition to transplant to the various plantations the ensuing year, and will considerably increase their representation.

Greenhouse.

All the plants of this collection, at present located in the greenhouse at Columbia University, have been thoroughly labeled this fall with data labels, no attempt being made to supply show labels until the collection is moved into the new Horticultural Houses. This collection contains 84 families, representing 258 genera and 679 species and varieties.

Labels.

A sample of the tree label referred to above is herewith submitted. It is cut from sheet zinc, coated with paint, and given a supplemental coat of varnish. When put up it is bent to the form of the tree, the natural spring of the metal preserving it in its form and keeping it close to the bark. It is quite inconspicuous at a distance, can be made at a cost much less than that of the label formerly used for this pur-

pose, and it cannot be broken. As stated above, about 200 of these labels have been placed on trees, have been exposed to the changeable weather of the past three months, and have stood the test thus far with entire satisfaction.

A sample is also submitted of a new zinc label for the Herbaceous Grounds and other plantations requiring similar labeling. It is designed to do away with the zinc data label, combining in itself both the show label and that used for recording data. The label proper and the standard are separate, so that the label itself may be very readily removed or replaced when worn out. The data can be placed upon the face of the standard as indicated, being protected by the card. The card is made waterproof by immersion in paraffin, and a coat of varnish added to the outer surface to give it a hard finish and prevent its collecting dust or dirt. Both the standard and card can be manufactured cheaply, the two costing considerably less than the former wooden label used for this purpose. It can be made in several sizes and used in any collection where a small label is required. It is particularly well adapted for the Horticultural Houses.

Herbarium and Card Catalogue.

The collection of herbarium specimens of the plants under cultivation, begun in 1897, has been continued. Its efficiency has been much increased by numbering the plant from which the specimen was taken and placing a corresponding number on the herbarium sheet. This makes a permanent record, and will be of much use for future reference in settling disputed points. About 1500 specimens were secured during the year. These have been mounted and incorporated in the herbarium of cultivated plants.

The Card Catalogue has been kept posted up during the year, and all additions and cancellations properly recorded.

Wild Flora.

During the past year a number of plants unrecorded in the list published in Bulletin No. 4 of last year have been de-

tected by various members of the staff, and are incorporated in a list appended to this report.

Respectfully submitted,

GEO. V. NASH,

General Assistant.

Jan. 5th, 1900.

HERBACEOUS GROUNDS.

PTERIDOPHYTA.

OPHIOGLOSSACEAE.

Botrychium dissectum.
lanceolatum.
obliquum.
simplex.
Virginianum.
Ophioglossum arenarium.
vulgatum.

OSMUNDACEAE.

Osmunda cinnamomea.
Claytoniana.
regalis.

SCHIZAEACEAE.

Lygodium palmatum.

POLYPODIACEAE.

Adiantum pedatum.
Asplenium acrostichoides.
angustifolium.
Filix-foemina.
(red-stemmed.)
Gouringianum pictum.
platyneuron.
Trichomanes.
Camptosaurus rhizophyllus.
Cystopteris bulbifera.
fragilis.
Dennstaedtia punctilobula.
Dryopteris Boottii.
cristata.
× marginalis.
Filix-mas.
Goldieana.
Dryopteris marginalis.
Nevadensis.
Noveboracensis.
simulata.
spinulosa.
intermedia.
Thelypteris.
Lomaria spicant.
Meteuccia Struthiopteris.
Onoclea sensibilis.
Pellaea atropurpurea.
Phegopteris Dryopteris.
hexagonoptera.
Phegopteris.
Phyllitis Scolopendrium.
Polypodium vulgare.
Polystichum acrostichoides.
aculeatum.
Braunii.
Pteris aquilina.
Woodsia Ilvensis.
obtusa.

EQUISETACEAE.

Equisetum arvense.
fluviatile.
hyemale.

LYCOPODIACEAE.

Lycopodium lucidulum.
sp.
sp.

SELAGINELLACEAE.

Selaginella apus.
rupestris.

SPERMATOPHYTA.

Monocotyledones.

SPARGANIACEAE.

Sparganium sp.

ALISMACEAE.

Alisma Plantago-aquatica.

BUTOMACEAE.

Hydrocleys nymphoides.

HYDROCHARIDACEAE.

Philotria Canadensis.

GRAMINEAE.

Agropyron dasystachyum.
Japonicum.
repens.
spicatum.
tenerum.
Agrostis alba.
perennans.
Andropogon brevifolius.
Virginicus.
Anthoxanthum odoratum.
Arrhenatherum elatius.
Arundinella anomala.
Arundo Donax.
variegata.
Avena alba.
fatua.
sterilis.
strigosa.
Brachypodium sylvaticum.
Briza maxima.
minor.
Bromus albidus.
arvensis.
brachystachyus.
breviaristatus.
brizaeformis.
erectus.
geniculatus.
glaucus.
hordeaceus.
inermus.
maximus.
Bulbilis dactyloides.
Calamagrostis Canadensis.
Calamovilfa longifolia.
Chaetochloa viridis.
Coix Lachryma-Jobi.
Dactylis glomerata.
Danthonia spicata.
Elymus arenarius.
Canadensis.
glaucus.
Virginicus.
Erianthus brevibarbis.
Festuca arundinacea.
capillata.
duriuscula.
crassifolia.
elatior.
grandiflora.
heterophylla.
nigrescens.
ovina duriuscula trachyphylla.
ovina sulcata.
Gaudinia fragilis.
Holcus lanatus.
Homalocenchrus Virginicus.
Hordeum Hystrix.
trifurcatum.
Koeleria hirsuta.
Lasiagrostis argentea.
Lolium Italicum.
perenne.
Miscanthus Sinensis gracillimus.
variegatus.
zebrinus.
Muhlenbergia sobolifera.
tenuiflora.
Nazia racemosa.
Oryza sativa.
Panicularia brachyphylla.
nervata.
pallida.
Panicum agrostoides.
Ashei.
Atlanticum.
barbulatum.
Bicknellii.

Panicum clandestinum.
commutatum.
depauperatum.
dichotomum.
elongatum.
linearifolium.
macrocarpon.
polyanthes.
Porterianum.
pubescens.
Scribnerianum.
sphaerocarpon.
tsugetorum.
virgatum.
Pennisetum compressum.
Phalaris arundinacea.
picta.
Canariensis.
minor.
Phleum pratense.
Phragmites Phragmites.
Poa alpina.
brevifolia.
compressa.
flava.
nemoralis.
pratensis.
Savastana odorata.
Secale cereale.
Sesleria cylindrica.
Sorghum Saccharatum.
Spartina cynosuroides.
aurea-marginata.
Syntherisma fimbriatum.
humifusum.
Themeda Forskalii.
Tricuspis seslerioides.
Tripsacum dactyloides.
Triticum compactum.
cylindricum.
monococcum.
ovatum.
Uniola latifolia.
Weingaertneria canescens.
Zea tunicata.

CYPERACEAE.

Carex arctica.
Asa-Grayi.
cephalophora.
crinita.
divulsa.
flexilis.
grisea.
laxiculmis.
laxiflora.
patulifolia.
lurida.
pallescens.
pedicellata.
Pennsylvanica.
pubescens.
retrorsa.
rosea.
scoparia.
sterilis.
stipata.
stricta.
trichocarpa.
typhinoides.
virescens.
vulpinoidea.
xanthocarpa.
Cyperus alternifolius.
esculentus.
filiculmis.
strigosus.
Eleocharis tenuis.
Fimbristylis autumnalis.
Scirpus atrovirens.
microcarpus.
zebrinus.

ARACEAE.

Acorus Calamus.
variegatus.
Japonicus variegatus.
Arisaema Dracontium.
pumilum.
triphyllum.
Caladium bicolor.
Calocasia antiquorum.
Orontium aquaticum.
Sauromatum Simlense.
Spathyema foetida.

COMMELINACEAE.

Commelina coelestis.

Tinanita fugax.
Tradescantia occidentalis.
pilosa.
reflexa.
Virginiana.
alba.

PONTEDERIACEAE.

Heteranthera reniformis.
Piaropus crassipes.

JUNCACEAE.

Juncoides campestre.
nemorosum.
Juncus acuminatus.
marginatus.
tenuis.

MELANTHACEAE.

Chamaelirium luteum.
Chrosperma muscaetoxicum.
Helonias bullata.
Melanthium parviflorum.
Stenanthium gramineum.
Tricyrtis hirta.
Uvularia grandiflora.
nitida.
sessilifolia.
Veratrum viride.
Xerophyllum asphodeloides.
Zygadenus elegans.
leimanthoides.
Nuttallii.

LILIACEAE.

Aletris farinosa.
Allium acuminatum.
album.
angulosum.
Babingtonii.
cernuum.
Cydni.
fistulosum.
flavidum.
fragrans.
Ledebourianum.
Moly.
Murrayanum.
nutans.
odorum.
Allium oleraceum.
Ophioscorodon.
paniculatum longispathum.
reticulatum.
sativum.
Schoenoprasum.
Scorodoprasum.
Babingtonii.
senescens.
subhirsutum.
tricoccum.
vineale.
Asphodeline Liburnica.
Asphodelus fistulosus.
Bulbine annua.
Funkia albomarginata.
plantaginea praecox.
subcordata.
undulata variegata.
Galtonia candicans.
Hemerocallis flava.
fulva.
Kwanso.
Middendorffii.
Thunbergii.
Hyacinthus Romanus.
Kniphofia Uvaria.
Leucocrinum montanum.
Lilium auratum macranthum.
Batemannii.
Canadense.
rubrum.
Childsii.
Colchesteri.
elegans "Alice Wilson."
"aurora."
"bicolor."
citrinum.
"Leonard Joerg."
"Painted Chief."
"Quilp."
roseum.
semi-fl. pl.
Fortunei.
Grayi.
Harrisii.
longiflorum.
variegatum."

Lilium pardalinum.
robustum.
rubellum.
speciosum Henryi.
Kratzeri.
melporum.
monstrosum album.
rubrum.
"Opal."
praecox.
punctatum.
roseum.
rubrum.
superbum.
Takesima.
tenuifolium.
tigrinum.
splendens.
umbellatum.
Wallacei.
Nothoscordon inodorum.
Ornithogalum umbellatum.
Paradisea Liliastrum.
Quamasia esculenta.
Scilla Peruviana.
Yucca angustifolia.
filamentosa.
glauca.
recurvifolia.
rupicola.

CONVALLARIACEAE.

Asparagus officinalis.
Clintonia borealis.
umbellulata.
Convallaria majalis.
Disporum lanuginosum.
Medeola Virginiana.
Polygonatum biflorum.
commutatum.
multiflorum.
Polygonatum.
verticillatum.
Streptopus roseus.
Trillium erectum.
erythrocarpum.
recurvatum.
Underwoodii.
Unifolium Canadense.
Vagnera amplexicaulis.
racemosa.
stellata.

SMILACEAE.

Smilax ecirrhata.

AMARYLLIDACEAE.

Agave Virginica.
Amaryllis formosissima.
Reginae.
Cooperia Drummondii.
Crinum Capense.
longifolium.
roseum.
Moorei.
Hymenocallus Charlus albus.
sp.
Hypoxis hirsuta.
Ismene Calathena.
Pancratium maritimum.
Phaedranassa gloriosa.
Zephyranthes floribunda.
striata.
sulphurea.

IRIDACEAE.

Gemmingia Chinensis.
Gladiolus sp.
Iris Caroliniana.
cristata.
Germanica.
Kaempferi.
lacustris.
laevigata.
Missouriensis.
prismatica.
pumila.
Sibirica.
atropurpurea.
flexuosa.
orientalis.
polymnia.
verna.
versicolor.
Sisyrinchium albidum.
Atlanticum.
Tritonia crocosmaeflora.
elegans.

CANNACEAE.

Canna sp.

MARANTACEAE.

Thalia dealbata.

ORCHIDACEAE.

Aplectrum spicatum.
Cypripedium hirsutum.
parviflorum.
Habenaria ciliaris.
Habenaria lacera.
Isotria verticillata.
Leptorchis liliifolia.
Loeselii.
Orchis fusca.
maculata.
militaris.
pallens.
spectabilis.
Tipularia unifolia.

Dicotyledones.

SAURURACEAE.

Saururus cernuus.

URTICACEAE.

Parietaria officinalis.
Urtica dioica.
gracilis.
Urticastrum divaricatum.

SANTALACEAE.

Comandra pallida.

ARISTOLOCHIACEAE.

Aristolochia Clematitis.
Asarum acuminatum.
Canadense.
reflexum.
Shuttleworthii.

POLYGONACEAE.

Emex spinosa.
Eriogonum Alleni.
campanulatum.
flavum.
microthecum diffusum.
umbellatum.
Fagopyrum emarginatum.
Fagopyrum.
Polygonum amplexicaule.
aviculare.
orientale.
Pennsylvanicum.
Sachalinense.
sagittatum.
setaceum.
Virginianum.
Zuccarinii.
Rheum crassinervium.
Franzenbachii.
Rhaponticum.
tetragonopus.
undulatum.
Rumex Acetosa.
Acetosella.
alpinus.
altissimus.
aquaticus.
confertus.
crispus.
cristatus.
hymenosepalus.
obtusifolius.
Patientia.
reticulatus.
roseus.
salicifolius.
Steudelii.
venosus.
verticillatus.
sp.

CHENOPODIACEAE.

Atriplex canescens.
hortensis.
cupreata.
Sibirica.
Beta hortensis metallica.
patula.
Chenopodium album.
ambrosioides.
Bonus-Henricus.
Botrys.
opulifolium.
virgatum.

Corispermum hyssopifolium.

AMARANTHACEAE.

Alternanthera paronychioides.
Amaranthus albus.
caudatus albus.
chlorostachys.
emarginatus.
hybridus.
hypochondriacus.
paniculatus.
viridis atropurpureus.
Froelichia Floridana.

NYCTAGINACEAE.

Allionia nyctaginea.
viscosa.
Mirabilis Jalapa.

PHYTOLACCACEAE.

Phytolacca acinosa.
decandra.

AIZOACEAE.

Mesembryanthemum crystallinum.
Lehmannii.
multiceps.
Mollugo verticillata.
Tetragonia expansa.

PORTULACACEAE.

Calandrinia longiscapa.
Menziesii.
pilosiuscula.
umbellata.
Claytonia Chammissoi.
lanceolata.
Portulaca grandiflora.
Talinum parviflorum.

BASELLACEAE.

Basella alba.

CARYOPHYLLACEAE.

Agrostemma Githago.
Alsine graminea.
Holostea.
laurifolia.
longifolia.
media.
Anychia Canadensis.
dichotoma.
Arenaria verna.
Cerastium alpinum.
arvense.
oblongifolium.
hirsutum.
tomentosum.
viscosum.
vulgatum.
Corrigiola littoralis.
Dianthus alpestris.
arenarius.
atrorubens.
barbatus.
capitatus.
Caucasicus.
Chinensis.
ciliatus.
congestus.
cruentus.
cyclops.
deltoides.
fimbriatus.
fragrans.
giganteus.
latifolius.
Liburnicus.
Mussinii.
petraeus.
plumarius.
annulatus.
serotinus.
pubescens.
squarrosus.
Sternbergii.
superbus.
sylvaticus.
tenax.
tener.
tenuiflorus.
Gypsophila acutifolia.
paniculata.
perfoliata.
repens.
Lychnis alba.
Chalcedonica.
Coronaria.
dioica.
Flos-Cuculi.

Lychnis Flos-Jovis.
Viscaria.
Paronychia Arabica.
Polycarpaea Teneriffae.
Scleranthus annuus.
Silene acaulis.
Armeria.
Caroliniana.
catholica.
diurniflora.
Gallica.
Italica.
laeta.
livida.
longicaulis.
longicilia.
longiflora.
Lusitanica.
maritima.
noctiflora.
nutans.
orientalis.
petraca.
rubella.
Saxifraga.
Schafta.
stellata.
Thorei.
Virginica.
viridiflora.

NYMPHAEACEAE.

Castalia Leydeckeri rosea.
sulphurea.
odorata.
rosea.
stellata.
Zanzibariensis rosea.

RANUNCULACEAE.

Aconitum Columbianum.
reclinatum.
uncinatum.
Actaea alba.
Adonis vernalis.
Anemone Canadensis.
Caroliniana.
cylindrica.
multifida.
occidentalis.
Anemone quinquefolia.
Virginiana.
Aquilegia alpina.
Buergeriana.
Canadensis.
chrysantha.
ciliata.
coerulea.
glandulosa.
leptoceras.
Olympica.
Sibirica.
Skinneri.
vulgaris alba.
grandiflora.
Batrachium trichophyllum.
Cimicifuga Americana.
racemosa.
Clematis Douglasii.
Fremontii.
integrifolia.
ochroleuca.
ovata.
recta.
stans.
Delphinium Ajacis.
Carolinianum.
elatum.
formosum.
grandiflorum.
Menziesii.
occidentale.
scopulorum.
Staphisagria.
sp.
Eranthis hyemalis.
Helleborus foetidus.
niger.
Hepatica acuta.
Hepatica.
Hydrastis Canadensis.
Paeonia sp.
Pulsatilla Pulsatilla.
Ranunculus fascicularis.
inamoenus.
Syndesmon thalictroides.
Thalictrum coriaceum.
dioicum.

Thalictrum elatum.
Fendleri.
flavum.
glaucum.
macrocarpum.
minus.
concinnum.
elatum.
squarrosum.
Trollius Asiaticus.
Europaeus.
laxus.
Xanthorrhiza apiifolia.

BERBERIDACEAE.

Caulophyllum thalictroides.
Diphylleia cymosa.
Jeffersonia diphylla.
Podophyllum peltatum.
Vancouveria hexandra.

PAPAVERACEAE.

Argemone platyceras.
Bocconia cordata.
Eschscholtzia glauca.
Glaucium Fischeri.
flavum.
luteum.
rubrum.
Hypecoum procumbens.
Papaver Caucasicum.
orientale.
pilosum.
Rhoeas.
rupifragum Atlanticum.
Sanguinaria Canadensis.

FUMARIACEAE.

Bicuculla Cucullaria.
eximia.
spectabilis.
Capnoides sempervirens.

CRUCIFERAE.

Alyssum argenteum.
articulatum.
calycinum.
edentulum.
Gemonense.
sinuatum.
Arabis albida.
Arabis Allionii.
bellidifolia.
hirsuta.
nemorosa.
pumila.
rosea.
Turrita.
Aubrietia Graeca.
Barbarea Barbarea.
Biscutella auriculata.
raphanifolia.
Brassica juncea.
nigra.
Bunias orientalis.
Clypeola Jonthlaspi.
Dentaria maxima.
Draba incana.
Erysimum asperum.
cheiranthoides.
cuspidatum.
hieracifolium.
odoratum.
Perofskianum.
pulchellum.
strictum.
virgatum.
Euclidium Syriacum.
Farsetia clypeata.
eriocarpa.
Hesperis matronalis.
Iberis corifolia.
Garrexiana.
Pruetii.
sempervirens.
Sibirica.
Isatis praecox.
tinctoria.
Kernera saxatilis.
Lepidium campestre.
graminifolium.
Lunaria biennis.
rediviva.
Neslia paniculata.
Peltaria alliacea.
Roripa Pyrenaica.
Sisymbrium Austriacum.

CAPPARIDACEAE.

Cleome Candelabra.

Cleome serrulata.
sp.
Polanisia graveolens.
trachysperma.

RESEDACEAE.

Reseda alba.
lutea.
Luteola.

SARRACENIACEAE.

Sarracenia purpurea.

DROSERACEAE.

Drosera rotundifolia.

CRASSULACEAE.

Cotyledon teretrum.
Sedum acre.
album.
atropurpureum.
Ewersii.
Hibernicum.
hybridum.
Japonicum.
Kamschaticum.
Maximowiczii.
reflexum.
rhodanthum.
roseum.
sexangulare.
speciosum.
spectabile.
album.
stenopetalum.
stoloniferum.
telephioides.
ternatum.
Telephium.
Sempervivum cuneatum.
Ruthenicum.
tectorum.
Verloti.

SAXIFRAGACEAE.

Astilbe Japonica.
Heuchera Americana.
bracteata.
parvifolia.
pubescens.
ribifolia.
Heuchera sanguinea alba.
villosa.
Wheeleri.
Mitella diphylla.
Peltaphyllum peltatum.
Saxifraga acaulis.
Aizoon.
bronchialis.
caespitosa.
cordifolia.
Cotyledon.
erosa.
latifolia.
leucanthemifolia.
nivalis.
Pennsylvanica.
speciosa.
Virginiensis.
Therofon aconitifolium.
Tiarella cordifolia.

ROSACEAE.

Acaena myriophylla.
ovalifolia.
pinnatifolia.
Sanguisorba.
sarmentosa.
Agrimonia leucantha.
odorata.
parviflora.
repens.
striata.
villosa.
Alchemilla arvensis.
vulgaris.
Argentina Anserina.
Aruncus Aruncus.
Comarum palustre.
Dasyphora fruticosa.
Dryas octopetala.
fissa.
Drymocallis rupestris.
Duchesnea Indica.
Fragaria glauca.
vesca.
Virginiana.
Geum Canadense.
Chiloense.
coccineum.

Geum hispidum.
intermedium.
nutans.
rivale.
Rossii.
rugosum.
strictum.
sp.
sp.
Kunzia tridentata.
Porteranthus stipulaceus.
trifoliatus.
Potentilla alpestris.
argentea.
argentea × verna.
atrosanguinea.
biennis.
collina.
Canadensis.
desertorum.
delphinensis.
digitata × flabellata.
Dombeyi.
gracilis.
rigida.
heptaphylla.
Hippiana.
hirta.
hybrida.
Kotschyana.
Kurdica.
leucotricha.
Macnabiana.
Monspeliensis.
Montenegrina.
multifida.
ontopoda.
Pennsylvanica.
arachnoides.
pulcherrima.
pumila.
Schrenkiana.
simplex.
sulphurea.
tenacetifolia.
Thyriaca.
Vlasicensis.
sp.
Potentilla sp.
sp.
Rubus parviflorus.
Sanguisorba alpina.
annua.
Canadensis.
lateriflora.
tenuiflora.
Sibbaldiopsis tridentata.
Sieversia ciliata.
Spiraea astilboides.
longigamis.
Ulmaria Filipendula.
palmata.
Ulmaria.
Waldsteinia fragarioides.

CAESALPINACEAE.

Cassia Chamaecrista.
Marylandica.
nictitans.

PAPILIONACEAE.

AEschynomene Indica.
Amorpha nana.
Anthyllis tetraphylla.
Vulneraria.
Astragalus alpinus.
Carolinianus.
chlorostachys.
Cicer.
falcatus.
galegiformis.
Glycyphyllos.
Monspeliensis.
Narbonensis.
pentaglottis.
sulcatus.
vicioides.
Baptisia australis.
leucantha.
tinctoria.
Biserrula Pelecinus.
Cicer arietinum.
Colutea arborescens.
Coronilla Atlantica.
Cytisus praecox.
Ervilia Abyssinica.
Ervum Lens.

Falcata comosa.
Galega officinalis.
alba.
orientalis.
Persica.
Genista tinctoria.
Glycine Soja.
Glycyrrhiza echinata.
glabra.
lepidota.
Hedysarum multijugum.
Kuhnistera candida.
purpurea.
tenuifolia.
Lathyrus Aphaca.
Caput-galli.
Cicera.
decaphyllus.
ensifolius.
latifolius.
Ochrus.
Onobrychis.
platyphyllus.
pseudo-aphaca.
Pyrenaicus.
sylvestris.
venosus.
Lespedeza bicolor.
capitata.
hirta.
procumbens.
violacea.
Lotus Americana.
edulis.
tenuis.
Tetragonolobus.
Lupinus affinis.
albus.
angustifolius.
formosus.
hirsutus.
polyphyllus.
Medicago aculeata.
ambigua.
Blancheana.
depressa.
Gerardi.
globulosa.
Medicago glutinosa.
sativa.
scutellata.
Terabellum.
Meibomia Canadensis.
Dillenii.
Illinoensis.
nudiflora.
viridiflora.
Melilotus coerulea.
Indica.
officinalis.
Ononis alopecuroides.
arvensis.
maritima.
spinosa.
Ornithopus ebracteatus.
sativus.
Oxytropis glabra.
Phaca neglecta.
Phaseolus Mungo.
Ricciardianus.
Psoralea Onobrychis.
orbicularis.
Scorpiurus muricata.
subvillosa.
sulcata.
Securigera Coronilla.
Thermopsis Caroliniana.
montana.
rhombifolia.
Trifolium incarnatum.
minus.
ochroleucum.
Pannonicum.
pratense.
repens.
pictum.
stellatum.
suaveolens.
subterraneum.
Vicia Cracca.
dumetorum.
gigantea.
Leavenworthii.
sativa.

GERANIACEAE.

Erodium Botrys.

Erodium chium.
cicutarium.
maculatum.
gruinum.
macradenum.
Manescavi.
moschatum.
pauciflorum.
Geranium asphodeloides.
Carolinianum.
collinum.
cristatum.
Fremontii.
maculatum.
var.
pratense album.
Pyrenaicum.
Richardsonii.
rivulare.
Robertianum.
sanguineum.
Sibiricum.
Wilfordii.
Pelargonium quinatum.
zonale leucanthum.

OXALIDACEAE.

Oxalis corniculata atropurpurea.
stricta.
cymosa.
grandis.
rosea.
Valdiviana.
violacea.

TROPAEOLACEAE.

Tropaeolum aduncum.

LINACEAE.

Linum Altaicum.
angustifolium.
grandiflorum.
Lewisii.
perenne.
usitatissimum.

RUTACEAE.

Dictamnus Fraxinella.
Ruta graveolens.
macrophylla.

EUPHORBIACEAE.

Euphorbia corollata.
Cyparissias.
deflexa.
dendroides.
dentata.
Esula.
exigua.
falcata.
graminea.
Helioscopia.
heterophylla.
Liburnica.
linariaefolia.
lucida.
marginata.
platyphylla.
robusta.
spongiosa.
stricta.
verrucosa.
sp.
Mercurialis annua.
perennis.

CALLITRICHACEAE.

Callitriche sp.

BALSAMINACEAE.

Impatiens Balsamina.
biflora.
Roylei.
tricornis.

MALVACEAE.

Abutilon Abutilon.
Althaea cannabina.
ficifolia.
rosea.
Heldreichii.
Kirrindensis.
officinalis.
pallida.
rosea.
sulphurea.
Taurinensis.
Anoda hastata.
Wrightii.
Callirrhoë involucrata.

Hibiscus esculentus.
militaris.
Moscheutos.
albus.
Trionum.
Kitaibelia vitifolia.
Lavatera maritima.
punctata.
Malva Abyssinica.
Alcea.
crispa.
moschata alba.
Nicaeensis.
parviflora.
sylvestris.
verticillata.
Malvastrum Capense.
coccineum.
Limense.
Pavonia Arabica.
Sida triloba.
Sidalcea candida.

HYPERICACEAE.

Hypericum Androsaemum.
Ascyron.
atomarium.
aureum.
Moserianum.
prolificum.
Sarothra gentianoides.

CISTACEAE.

Helianthemum Canadense.
Lechea Leggettii.
minor.
villosa.

VIOLACEAE.

Cubelium concolor.
Viola aetolica.
affinis.
amoena.
blanda.
Brittoniana.
Canadensis.
canina.
cornuta.
cucullata.
domestica.
elatior.
emarginata.
hastata.
hirta.
Jooi.
Labradorica.
obliqua.
ovata.
palmata.
dilatata.
papilionacea.
Patrina.
pedata.
pedatifida.
persicifolia.
polychroma.
Porteriana.
pubescens.
Rossica.
rostrata.
rotundifolia.
sororia.
scabriuscula.
Selkirkii.
striata.
sylvestris.
villosa.

LOASACEAE.

Mentzelia aurea.
sp.

CACTACEAE.

Cactus Missouriensis.
viviparus.
Cereus viridiflorus.
Echinocactus Simpsoni.
minor.
Opuntia fragilis.
humifusa.
mesacantha Greenei.
macrorrhiza.
Opuntia.
polyacantha.
albospina.

LYTHRACEAE.

Decodon verticillatus.
Lythrum Salicaria.
Parsonsia lanceolata.

ONAGRACEAE.

Chamaenerion angustifolium.
Circaea Lutetiana.
Epilobium Abyssinicum.
Dodonaei.
montanum.
Gaura biennis.
Lindheimeri.
parviflora.
Godetia amoena.
Lindleyana.
Hartmannia tetraptera.
Kneiffia Fraseri.
fruticosa.
pumila.
riparia.
Lavauxia brachycarpa.
Ludwigia alternifolia.
Megapterium Missouriense.
OEnothera cruenta.
mollissima.
odorata.
rhizocarpa.
Onagra biennis.
grandiflora.
Oakesiana.
parviflora.
Pachylophus caespitosus.

HALORAGIDACEAE.

Haloragis alata.

ARALIACEAE.

Aralia hispida.
racemosa.
Panax quinquefolia.

UMBELLIFERAE.

Aletes acaulis.
Ammi majus.
Angelica atropurpurea.
Curtisii.
officinalis.
villosa.
Apium graveolens.
Petroselinum.
Bowlesia tenera.
Bupleurum Candollei.
rotundifolium.
Carum Kelloggii.
Cicuta maculata.
Conium maculatum.
Daucus Carota.
Mauritanicus.
Deringa Canadensis.
Didiscus pusillus.
Eryngium aquaticum.
Billardieri.
campestre.
coeruleum.
planum.
Foeniculum vulgare.
Heracleum gummiferum.
lanatum.
Hydrocotyle Americana.
Laserpitium hispidum.
Levisticum Levisticum.
Ligusticum apiifolium.
Musineon trachysperma.
OEnanthe Lachenalii.
peucedanifolia.
pimpinelloides.
silaifolia.
australis.
Pastinaca sativa.
Pegamum Hormala.
Peucedanum graveolens.
Munbyi.
redivivum.
verticillare.
Pimpinella Anisum.
aromatica.
peregrina.
Saxifraga.
Scandix brachycarpa.
macroryncha.
Pectens-Veneris.
Seseli glabratum.
glaucum.
gummiferum.
Pallasii.
Thaspium aureum.
trifoliatum.
Tordelium opulum.
Zizia aurea.
Bebbii.
cordata.

PYROLACEAE.

Chimaphila maculata.
Pyrola rotundifolia.

ERICACEAE.

Arctostaphylos Uva-Ursi.
Dendrium buxifolium prostratum.
Gaultheria procumbens.

DIAPENSIACEAE.

Galax aphylla.
Shortia galacifolia.

PRIMULACEAE.

Anagallis arvensis.
coerulea.
Androsace lactiflora.
septentrionalis.
Dodecatheon Hendersonii.
Meadia.
pauciflora.
Lubinia atropurpurea.
Lysimachia atropurpurea.
Nummularia.
punctata.
quadrifolia.
terrestris.
Primula officinalis.
Steironema ciliatum.

PLUMBAGINACEAE.

Limonium latifolium.
Plumbago Larpentae.
Statice Armeria.
binervosa.
plantaginea.
setacea.

GENTIANACEAE.

Frasera speciosa.
Gentiana Parryi.
Swertia perennis.

APOCYNACEAE.

Amsonia Amsonia.
salicifolia.
Apocynum cannabinum.
Vinca rosea.

ASCLEPIADACEAE.

Acerates auriculata.
viridiflora.
Asclepias exaltata.
incarnata.
pulchra.
speciosa.
Sullivantii.
Syriaca.
tuberosa.
verticillata.
Cynanchum acuminatum.
fuscatum.
Mongolicum.
Vincetoxicum.
Vincetoxicum obliquum.

CONVOLVULACEAE.

Convolvulus siculus.
tricolor.
Ipomoea purpurea.

POLEMONIACEAE.

Collomia coccinea.
grandiflora.
linearis.
Gilia coronopifolia.
millifoliata.
multicaulis.
squarrosa.
Phlox amoena.
canescens.
glaberrima.
paniculata.
pilosa.
reptans.
subulata.
sp.
Polemonium coeruleum.
album.
Himalayanum.
reptans.
Van Bruntiae.

HYDROPHYLLACEAE.

Hydrophyllum Canadense.
occidentale.
Virginicum.
Nemophila insignis.
Phacelia tanacetifolia.

BORAGINACEAE.

Anchusa altissima.

Anchusa Barrelieri.
Capensis.
Italica.
officinalis.
Cerinthe major.
minor.
Cynoglossum furcatum.
Germanicum.
montanum.
Nebrodense.
officinale.
Heliotropium Europaeum.
Lindelofia spectabilis.
Lithospermum angustifolium.
multiflorum.
Lycopsis arvensis.
Mertensia lanceolata.
Sibirica.
Virginica.
Myosotis palustris.
Omphalodes linifolium.
Symphytum echinatum.
officinale.
Ziziphora tenuior.

VERBENACEAE.

Caryopteris Mastacanthus.
Lippia cuneifolia.
Verbena bipinnatifida.
Bonariensis.
hastata.
officinalis.
urticifolia.

LABIATAE.

Agastache anethiodora.
nepetoides.
rugosa.
Ajuga Chamaepitys.
reptans.
variegata.
Amethystia coerulea.
Ballota Italica.
nigra.
alba.
Betonica officinalis.
alba.
Clinopodium Acinos.
alpinum.
Clinopodium Calamintha menthifolium.
Nepeta.
Collinsonia Canadensis.
Cunila origanoides.
Dracocephalum integrifolium.
Moldavica.
Ruyschianum.
Elsholtzia Patrinii.
Galeopsis ochroleuca.
Pyrenaica.
Tetrahit.
versicolor.
Glechoma hederacea.
Hyssopus officinalis.
aristatus.
Koellia flexuosa.
mutica.
Virginiana.
Lallemantia canescens.
peltata.
Lamium album.
maculatum.
album.
Leonurus Cardiaca.
Sibiricus.
Tataricus.
sp.
Lycopus Americanus.
Europaeus.
exaltatus.
Virginicus.
Marrubium leonuroides.
peregrinum.
vulgare.
Melissa officinalis.
Mentha aquatica.
Canadensis.
crispa.
gentilis.
Pulegium.
spicata.
Moluccella laevis.
spinosa.
Monarda Bradburiana.
didyma.
fistulosa.
media.

Mosla ocimoides.
Nepeta Cataria.
nuda.
racemosa.
sp.
sp.
Ocimum Basilicum.
canum.
graveolens.
Origanum Onites.
vulgare.
Phlomis aurea.
tuberosa.
Physostegia Virginiana.
Plectranthus glaucocalyx.
Prunella laciniata.
vulgaris.
Salvia Austriaca.
cacaliaefolia.
coccinea.
coerulea.
glutinosa.
Hispanica.
Horminum.
limbata.
lyrata.
nemorosa.
officinalis.
patens.
Pitcheri.
pratensis.
Sclarea.
Sibthorpii.
Regeliana.
tiliaefolia.
verbenacea.
verticillata.
virgata.
Scutellaria albida.
lateriflora.
lupulina.
Sideritis hyssopifolia.
scorioides.
Stachys alpina intermedia.
aspera.
Germanica.
hyssopifolia.
lanata.
Stachys macroura.
setifera.
sylvatica.
sp.
Teucrium Botrys.
Chamaedrys.
flavum.
lucidum.
Scorodonia.

NOLANACEAE.

Nolana atriplicifolia.

SOLANACEAE.

Atropa Belladonna.
Datura gigantea.
inermis.
Metel.
Tatula.
Hyoscyamus niger.
Nicandra physaloides.
Nicotiana alata.
glutinosa.
rustica.
Nierembergia frutescens.
Physalis angulata.
Francheti.
heterophylla.
ixocarpa.
Sarracha Jaltomata.
Solanum aculeatissimum.
atropurpureum.
citrullifolium.
cornutum.
Dulcamara.
haematocladon.
heterodoxum.
Japonicum.
laciniatum.
pyracanthum.
robustum.
sisymbrifolium.
Wiegandia Vigieri.

SCROPHULARIACEAE.

Antirrhinum majus.
Castilleia pallida.
Celsia Cretica.
Chelone glabra.
Lyoni.

Cymbalaria Cymbalaria.
Digitalis ambigua.
ferruginea.
gloxinioides.
lanata.
lutea.
media.
ochroleuca.
purpurea.
Elatinoides spuria.
Elephantella Groenlandica.
Hebenstreitia tenuifolia.
Leptandra Virginica.
Linaria bipartita.
Dalmatica.
genistaefolia.
littoralis.
multicaulis.
multipunctata.
Peloponnesiaca.
purpurea.
Mimulus alatus.
Pentstemon barbatus.
campanulatus.
confertus.
cyananthus.
diffusus.
Digitalis.
Richardsonii.
Torreyi.
sp.
sp.
Scrophularia alata.
aquatica.
leporella.
lucida.
Marylandica.
nodosa.
orientalis.
Scorodonia.
Verbascum Blattaria.
Cedreti.
Libani.
longifolium.
malacotrichum.
nigrum.
Haenkii.
Pannonicum.
Verbascum phlomoides.
plumoides.
virgatum.
Veronica Byzantina.
Chamaedrys.
latifolia.
longifolia.
maritima.
rupestris.
serpyllifolia.
Tournefortii.
sp.

MARTYNIACEAE.

Martynia formosa.
fragrans.
Louisiana.
lutea.

LENTIBULARIACEAE.

Utricularia intermedia.
vulgaris.

GLOBULARIACEAE.

Globularia trichosantha.
vulgaris.

ACANTHACEAE.

Justicia procumbens.
Ruellia ciliosa.
strepens.

PLANTAGINACEAE.

Plantago acanthiphylla.
amplexicaulis.
arachnoides.
arenaria.
cordata.
Coronopus.
Cynops.
gentianoides.
lanceolata.
major rubra.
sinuata.
media.
purpurascens.
Rugelii.
sp.

RUBIACEAE.

Asperula ciliata.

Asperula galioides.
gilanica.
glomerata.
setosa.
Crucianella angustifolia.
gilanica?
patula.
Galium boreale.
circaezans.
elatum.
erectum.
gracile.
Parisiense.
pilosum.
recurvum.
spurium.
tenuissimum.
tricorne.
triflorum.
verum.
Houstonia coerulea
longifolia.
serpyllifolia.
Mitchella repens.
Richardsonia pilosa.
Rubia tinctorium.
Sherardia arvensis.

CAPRIFOLIACEAE.

Triosteum angustifolium.
perfoliatum.

VALERIANACEAE.

Centranthus macrosiphon.
ruber.
albus.
Fedia Cornucopiae.
Valeriana edulis.
officinalis.
Valerianella carinata.

DIPSACEAE.

Cephalaria leucantha.
radiata.
sp.
Dipsacus fullonum.
laciniatum.
sylvestris.
Knautia arvensis.
Scabiosa atropurpurea.
Caucasica.
Columbaria.
daucoides.
Fisheri.
gramuntia.
graminifolia.
integrifolia.
Isitensis.
Japonica.
longifolia.
lutea.
micrantha.
Palestinus.
vestina.
Succisa australis.

CAMPANULACEAE.

Adenophora liliifolia.
suaveolens.
Campanula alliariaefolia.
Bononiensis.
Carpatica.
celtidifolia.
divaricata.
grandis.
latifolia.
medium.
calycantha.
punctata.
rapunculoides.
rhomboidea.
Trachelium.
phyteuma betonicaefolia.
Platycodon grandiflorum.
Mareisii.

LOBELIACEAE.

Lobelia cardinalis.

CICHORIACEAE.

Adopogon Carolinianum.
Dandelion montanum.
Virginicum.
Chariesis heterophylla.
Crepis biennis.
blattarioides.
Candollii.
Dioscoridis.

Crepis setosa.
virens.
Hedypnois Cretica.
Hieracium amplexicaule.
Anglicum.
aurantiacum.
buglossoides.
flagellare.
foliosum.
incisum.
iricum.
Jankae.
lactucaefolium.
lasiophyllum.
lingulatum.
maculatum.
nitidum.
pallidum.
pratense.
pulmonarioides.
Reichenbachii.
rubescens.
stoloniferum.
tridentatum.
virosum.
vulgatum.
sp.
Hyoseris radiata.
Hypochoeris glabra.
pinnatifida.
Lactuca angustana.
perennis.
Plumieri.
quercina.
Scariola.
spicata.
virosa.
Lapsana communis.
Leontodon hirtus.
Nabalus racemosus.
trifoliolatus.
Picris echioides.
hieracoides.
Rhagadiolus Hedypnois.
Taraxacum erythrospermum.
Taraxacum.
Tolpis barbata.
Tragopogon parvifolius.
Tragopogon pratense.
Urospermum picroides.

AMBROSIACEAE.

Ambrosia trifida.
Iva xanthiifolia.
Xanthium Italicum.
macrocarpon.
spinosum.
strumosum.

COMPOSITAE.

Achillea alpina.
grandiflora.
Millefolium.
rosea.
rubra.
nobilis.
Ptarmica.
Pyrenaica.
Reichardtiana.
serrata.
Sibirica.
tanacetifolia.
Actinella acaulis.
Actinomeris alternifolia.
Ageratum conyzoides.
Alfredia cernua.
Amellus annuus.
Ammobium alatum.
Anacyclus officinarum.
Anaphalis margaritacea.
Antennaria alpina.
ambigens.
Canadensis.
Carpathica pulcherrima.
dioica.
microphylla.
neglecta.
neodioica.
Parlinii.
plantaginifolia.
Anthemis altissima.
nobilis.
pallida.
tinctoria.
Aplopappus Parryi.
Arctium nemorosum.
tomentosum.

Arctotis calendulacea.
Arnica longifolia.
Artemisia annua.
filifolia.
frigida.
laciniata.
Ludoviciana.
nana.
Pontica.
Stelleriana.
tridentata.
Aster alpinus superbus.
Amellus.
azureus.
Bigelovii.
divaricatus.
Drummondii.
fastigiatus.
Faxoni.
laevis.
amplifolius.
lateriflorus.
Lowrieanus.
macrophyllus.
Novae-Angliae.
Novi-Belgii.
paniculatus simplex.
Porteri.
ptarmicoides.
puniceus.
salicifolius.
Tradescanti.
violaris.
sp.
sp.
Berkheya radula.
Bidens atrosanguinea.
Chinensis.
humilis.
pilosa.
trichosperma.
Boltonia asteroides.
latisquamea.
Brauneria purpurea.
Buphthalmum speciosum.
Calendula officinalis.
Calimeris incisa.
Callistephanus Chinensis.
Carduus altissimus.
carlinoides.
ciliatus.
crispus.
defloratus.
heterophyllus.
ligularis.
Pannonicus.
divaricatus.
spinosissimus.
serratulus.
tenuifolius.
tricholoma.
Carlina acaulis.
lanata.
Carthamus lanatus.
tinctorius.
Catananche bicolor.
coerulea.
Centaurea aspera.
atropurpurea.
Babylonica.
bicolor.
Calcitrapa.
calcitrapoides.
cirrhata.
Crocodylium.
Cyanus.
dealbata.
depressa.
eryngioides.
Friderici.
Jacea.
macrocephala.
Melitensis.
microptilon.
moschata.
nigra.
nigrescens.
Orphanidea.
pratensis.
salicifolia.
Salmantica.
Scabiosa.
suaveolens.
transalpina.
sp.
sp.

Centaurea sp.
Chamaepeuce Diacantha.
stellata.
Chrysanthemum Balsamita.
coronarium.
corymbosum.
lacustre.
Leucanthemum.
macrophyllum.
Myconis.
Parthenium.
praealtum.
uliginosum.
viscosum.
Chrysothamnus nauseosus.
Cnicus cynaroides.
Coleosanthus grandiflorus.
Coreopsis Atkinsoniana.
auriculata.
coronata.
lanceolata.
grandiflora.
rosea.
tripteris.
verticillata.
Cousinia Hystrix.
Dahlia variabilis.
Dimorphotheca pluvialis.
Dugaldea Hoopesii.
Echinops Persicus.
Ritro.
sphaerocephalus.
Emilia flammea.
Erigeron glabellus.
macranthus.
pulchellus.
speciosus.
Eupatorium ageratoides.
cannabinum.
maculatum.
perfoliatum.
purpureum amoenum.
serotinum.
Euthamia graminifolia.
leptocephala.
Gaillardia aristata.
bicolor.
Galinsoga brachystephana.
Galinsoga parviflora.
Gerbera nivea.
Guizotia oleifera.
Haplocarpa Leichtlinii.
Helenium autumnale.
pumilum.
striatum grandicephalum.
Helianthella quinquenervis.
Helianthus cucumerifolius.
debilis.
giganteus.
laetiflorus.
Maximiliani.
mollis.
occidentalis.
orgyalis.
pumilus.
scaberrimus.
strumosus.
tuberosus.
sp.
Helichrysum bracteatum.
Heliopsis helianthoides.
Inula Conyza.
ensifolia salicina.
Helenium.
macrocephala.
salicina.
Kuhnia eupatorioides.
Lacinaria pycnostachya.
scariosa.
spicata.
montana.
Leontopodium alpinum.
Lopezia minima.
Matricaria inodora.
discoidea.
Mesadenia atriplicifolia.
Onopordon Acanthium.
Illyricum.
Parthenium integrifolium.
Petasites palmata.
Petasites.
Polymnia Canadensis.
Pulicaria dysenterica.
Ratibida columnaris.
pulcherrima.
pinnata.

Rudbeckia amplexicaulis.
fulgida.
laciniata.
var.
maxima.
speciosa.
triloba.
Santivalia procumbens.
Santolina pectinata.
Saussurea albescens.
Scolymus Hispanicus.
Scorzonera Hispanica.
Senecio antennariifolius.
aureus.
Balsamitae.
chrysanthemifolius.
diversifolius.
Doria.
elegans.
macrophyllus.
viscosus.
Serratula coronata.
macrophylla.
Silphium laciniatum.
perfoliatum.
trifoliatum.
Solidago arguta.
Boottii.
caesia.
Canadensis.
Solidago flexicaulis.
gigantea.
juncea.
Ohioensis.
Riddellii.
rigida.
rugosa.
speciosa.
Virgaurea.
sp.
Spilanthes oleracea.
Stokesia laevis.
Synosma suaveolens.
Tagetes erecta.
patula.
Tanacetum boreale.
Huronense.
vulgare.
crispum.
Tridax trilobata.
Tussilago Farfara.
Ursinia pulchra.
Verbesina helianthoides.
Vernonia Arkansana.
Arkansana ?
Drummondii.
sp.
Xeranthemum cylindraceum.
Zinnia Haageana.
multiflora.

FRUTICETUM.

MYRICACEAE.

Comptonia peregrina.
Myrica Caroliniana.

SALICACEAE.

Salix discolor.
humilis.
laurifolia.
tristis.
sp.
(In *Salicetum*).
Populus candicans.
dilatata.
monilifera.
Siemoni.
Salix alba.
vitellina.
amygdaloides.
Bashfordiana.
capraea.
cordata.
vestita.
fragilis.
lucida.
purpurea.
sericea.
Sieboldiana.
Wardii.
sp.

BETULACEAE.

Alnus incana virescens.
serrulata.
Betula pumila fastigiata.
Corylus Americana.
Avellana.
Pontica.
purpurea.
rostrata.

FAGACEAE.

Quercus prinoides.

ULMACEAE.

Planera cuspidata.
Zelkova crenata.
crenata?

MORACEAE.

Morus Tatarica.

POLYGONACEAE.

Atraphaxis lanceolata.

TROCHODENDRACEAE.

Cercidiphyllum Japonicum.

RANUNCULACEAE.

Paeonia Moutan.
Xanthorrhiza apiifolia.

BERBERIDACEAE.

Berberis Aquifolium.
Murrayanum.
aristata floribunda.
Canadensis.
dulcis.
heteropoda.
Japonica.
Neuberti.
purpurea.
Sieboldii.
var.
spathulata.
Thunbergii.
virescens.
vulgaris.
sp.

CALYCANTHACEAE.

Butneria fertilis.
Butneria florida.
glauca.
occidentalis.

ANONACEAE.

Asimina triloba.

LAURACEAE.

Benzoin Benzoin.

SAXIFRAGACEAE.

Deutzia crenata.
gracilis.
parviflora.
Sieboldiana.
Hydrangea arborescens.
Otaksa.
paniculata grandiflora.
quercifolia.
radiata.
vestita.
Itea Virginica.
Philadelphus coronarius.
grandiflorus.
sp.
sp.

GROSSULARIACEAE.

Ribes aureum.
cereum.
Cynosbati.
Diacantha.
divaricatum.
fasciculatum Chinense.
floridum.
nigrum.
rotundifolium.
sanguineum.
atrorubens.

HAMAMELIDACEAE.

Corylopsis spicata.
Hamamelis Virginica.

ROSACEAE.

Comocarpa fruticosa.
Exochorda grandiflora.
Neviusia Alabamensis.
Opulaster Amurensis.
opulifolius.

Rhodotypos kerrioides.
Rosa acicularis.
Beggeriana.
Schrankii.
blanda.
Carolina.
cinnamomea.
ferruginea.
hispida.
humilis.
involuta Wilsoni.
Jemogilla.
lucida.
microphylla.
mollis.
multiflora.
Nutkana.
pisocarpa.
pomifera.
rubiginosa.
rugosa.
sericea.
spinosissima Altaica.
stylosa.
Rubus cuneifolius.
deliciosus.
odoratus.
parviflorus.
rosaefolius.
villosus.
Sorbaria sorbifolia.
Spiraea Bumalda.
callosa.
Cantoniensis.
cuneifolia.
dumosa.
Hookeri.
longigamis.
prunifolia.
rotundifolia.
salicifolia.
(purple flowered).
Thunbergii.
tomentosa
(white flowered).
trilobata.
Van Houttei.
Wateri.
Spiraea sp.
Stephanandra flexuosa.

POMACEAE.

Amelanchier Botryapium.
Aronia arbutifolia.
atropurpurea.
nigra.
Cotoneaster frigida.
Nummularia bacillaris.
obtusa.
Simmondsii.
vacillans floribunda.
Wheeleri.
Crataegus glandulosa.
punctata.
Cydonia Japonica.
Pyrus Parkmanii.

DRUPACEAE.

Amygdalus nana.
Prunus Americana.
Besseyi.
maritima.
Padus.
Pissardi.
Virginiana.
sp.

CAESALPINACEAE.

Cercis Canadensis.
Japonica.

PAPILIONACEAE.

Amorpha fruticosa.
Caragana arborescens.
pygmaea.
Colutea arborescens.
Coronilla Emerus.
Cytisus albus.
nigricans.
scoparius.
Andraeanus.
pendulus.
Genista capitata.
Germanica.
Lespedeza bicolor.
Robinia hispida.
Spartium junceum.

Sophora violacea.
Ulex Europaeus.

RUTACEAE.

Citrus trifoliata.
Ptelea trifoliata.
Xanthoxylum Americanum.
schinifolium.

BUXACEAE.

Buxus rotundifolia.

ANACARDIACEAE.

Cotinus Cotinus.
Rhus aromatica.
copallina.
glabra.
Osbeckii.

ILICACEAE.

Ilex glabra.
monticola.
Sieboldii.
verticillata.

CELASTRACEAE.

Euonymus alatus.
Americanus.
atropurpureus.
Europaeus.
Japonicus radicans.
sp.

STAPHYLEACEAE.

Staphylea Bumalda.
Colchica.
trifolia.

SAPINDACEAE.

Sapindus marginatus.
Xanthoceras sorbifolia.

HIPPOCASTANACEAE.

AEsculus parviflora.

RHAMNACEAE.

Ceanothus Americana.
Paliurus aculeatus.
Rhamnus alpinus.
cathartica.
sp.
sp.
Zizyphus vulgaris.

MALVACEAE.

Hibiscus Syriacus.

THEACEAE.

Stuartia pentagyna.

HYPERICACEAE.

Hypericum Androsaemum.
aureum.
calycinum.
densiflorum.
elatum.
patulum.
prolificum.

TAMARICACEAE.

Tamarix Africana.
Gallica.
Indica.

THYMELEACEAE.

Dirca pulustris.

ELAEAGNACEAE.

Elaeagnus hortensis.
longipes.
umbellata.
sp.
sp.
Hippophoë rhamnoides.
Lepargyraea argentea.

ARALIACEAE.

Aralia pentaphylla.
Dimorphanthus Mandshuricus.

CORNACEAE.

Cornus alba Sibirica.
alternifolia.
Amonum.
candidissima.
circinata.
Mas.
sanguinea.

CLETHRACEAE.

Clethra acuminata.
alnifolia.
canescens.

ERICACEAE.

Azalea lutea.
nudiflora.
Chamaedaphne calyculata.
Dendrium buxifolium.
Kalmia glauca.
Ledum latifolium.
Leucothoë Catesbaei.
Menziesia pilosa.
Pieris Mariana.
nitida.
Rhododendron Catawbiense.
maximum.
punctatum.
Vaseyi.
Rhodora Canadensis.

VACCINIACEAE.

Oxycoccus macrocarpus.
Vaccinium hirsutum.

STYRACACEAE.

Pterostyrax hispidum.
Styrax Japonicum.

OLEACEAE.

Chionanthus Virginica.
Forsythia Fortunei.
viridissima.
Lugustrum buxifolium.
Ibota.
medium.
var.
ovalifolium.
vulgare.
Syringa Pekinensis.
villosa.
vulgaris.
sp.

LOGANIACEAE.

Buddleia curviflora.

VERBENACEAE.

Callicarpa Japonica.
sp.
Clerodendron serotinum.
Vitex Agnus-castus.

CAPRIFOLIACEAE.

Diervilla Diervilla.
Middendorfiana.
sessilifolia.
splendens.
Leicesteria formosa.
Lonicera Alberti.
chrysantha.
coerulea.
dependens.
fragrantissima.
Ledebouri.
Maximowiczii.
Morrowi.
Phylomelae.
Ruprechtiana.
Standishii.
Xylosteum.
sp.
sp.
Symphoricarpos occidentalis.
racemosus.
Symphoricarpos.
Viburnum acerifolium.
cassinoides.
dentatum.
Lantana.
Lentago.
nudum.
Opulus.
nanum.
phlebotrichum.
plicatum.
prunifolium.
pubescens.
Sieboldii.
sp.
Weigela candida.
Desboisii.
rosea.

COMPOSITAE.

Artemisia Abrotanum.
procera.
Baccharis halimifolia.

ARBORETUM.

(Including the species of trees growing naturally in the Garden.)

GINGKOACEAE.

Gingko biloba.

TAXACEAE.

Taxus acuminata.
compacta.
baccata.
pyramidalis.
Canadensis.
cuspidata.

PINACEAE.

Chamaecyparis thyoides.
Juniperus Virginiana.
Larix laricina.
Pinus Austriaca.
contorta.
densiflora.
divaricata.
excelsa.
pungens.
Strobus.
sylvestris.
Thunbergii.
Taxodium distichum.
Tsuga Canadensis.

SALICACEAE.

Populus alba.
grandidentata.
tremuloides.
Salix alba vitellina.
Babylonica.
nigra.

JUGLANDACEAE.

Hicoria alba.
glabra.
microcarpa.
minima.
ovata.
Juglans cinerea.
nigra.
regia.

BETULACEAE.

Alnus glutinosa.
incisa.
Alnus Japonica.
sp.
Betula alba.
lenta.
nigra.
papyrifera.
populifolia.
ulmifolia.
Carpinus Americana.
Ostrya Virginiana.

FAGACEAE.

Castanea dentata.
Japonica.
Fagus Americana.
sylvatica.
Quercus alba.
coccinea.
imbricaria.
macrocarpa.
Michauxii.
palustris.
Phellos.
platanoides.
Robur.
rubra.
velutina.

ULMACEAE.

Celtis occidentalis.
Ulmus Americana.
campestris.
crassifolia.
racemosa.
Sinensis.

MORACEAE.

Broussonetia Kaempferi.
Morus Japonica.
Toxylon pomiferum.

TROCHODENDRACEAE.

Cercidiphyllum Japonicum.

MAGNOLIACEAE.

Liriodendron Tulipifera.
fastigiata.

Liriodendron Tulipifera variegata.
Magnolia acuminata.
tripetala.

LAURACEAE.

Sassafras Sassafras.

HAMAMELIDACEAE.

Liquidambar Styraciflua.

PLATANACEAE.

Platanus occidentalis.
orientalis.

POMACEAE.

Crataegus cordata.
Oxyacantha.
Malus coronaria.
Malus.
Soulardi.
Pourthiaea villosa.
Pyrus baccata.
edulis.
sinuata.
var.
communis.
melanocarpa.
microcarpa.
prunifolia.
flava.
macrantha.
rivularis.
spectabilis.
Toringo.
sp.
Sorbus Americana.
Aucuparia.

DRUPACEAE.

Prunus Allegheniensis.
Avium.
Cerasus.
divaricata.
myrobalana.
Pseudocerasus.
serotina.
sp.
sp.

CAESALPINACEAE.

Gleditsia triacanthos.

PAPILIONACEAE.

Robinia Pseudacacia.

RUTACEAE.

Cedrela Sinensis.
Phellodendron Amurense.
Japonicum.

SIMARUBACEAE.

Ailanthus glandulosa.

ANACARDIACEAE.

Cotinus cotinoides.
Rhus hirta.
Osbeckii.

ILICACEAE.

Ilex opaca.

ACERACEAE.

Acer campestre.
laetum.
Negundo.
obtusatum.
Pennsylvanicum.
platanoides.
Pseudoplatanus.
rubrum.
saccharinum.
Saccharum.

HIPPOCASTANACEAE.

AEsculus glabra.
Hippocastanum.

TILIACEAE.

Tilia Americana.
Europaea.

ARALIACEAE.

Acanthopanax ricinoides.
Aralia canescens.
Japonica.
spinosa.

CORNACEAE.

Cornus alternifolia.
florida.
Nyssa aquatica.

STYRACACEAE.

Mohrodendron Carolinum.
dipterum.

OLEACEAE.

Fraxinus Americana.
Bungeana.
excelsior.
lanceolata.
lutea.
Mandshurica.
nigra.
Oregona.
Pennsylvanica.
quadrangulata.

SCROPHULARIACEAE.

Paulownia tomentosa.

BIGNONIACEAE.

Catalpa Bungei.
Catalpa.
Kaempferi.
speciosa.

CAPRIFOLIACEAE.

Viburnum prunifolium.
Lentago.

VITICETUM.

SMILACEAE.

Smilax rotundifolia

DIOSCOREACEAE.

Dioscorea sativa.

ARISTOLOCHIACEAE.

Aristolochia macrophylla.

POLYGONACEAE.

Polygonum cilinode.

RANUNCULACEAE.

Clematis coccinea.
"Duke of Edinburgh."
"Gipsey Queen."
"Joan of Arc."
"Le Conatre."
"Madame Baron Veillard."
"Mrs. Lecoultre."
Sieboldii.

LARDIZABALACEAE.

Akebia quinata.

MENISPERMACEAE.

Cocculus Carolinus.
Menispermum Canadense lobatum.
Dahuricum.

ROSACEAE.

Rosa canina.
micrantha.
repens.

PAPILIONACEAE.

Kraunhia macrostachya.
multijuga.
Sinensis.
Lathyrus latifolius.

CELASTRACEAE.

Celastrus articulatus.
paniculatus.
scandens.

VITACEAE.

Ampelopsis bipinnata.
heterophylla.
Parthenocissus vitacea.
Vitis aestivalis.
cordifolia.
Labrusca.
monticola.
riparia.

DILLENIACEAE.

Actinidia polygama.

PASSIFLORACEAE.

Passiflora incarnata.

ASCLEPIADACEAE.

Periploca Graeca.

CONVOLVULACEAE.

Convolvulus arvensis.
incanus.
repens.
Sepium.
Ipomoea pandurata.

SOLANACEAE.

Lycium Chinense.
Solanum Dulcamara.

CAPRIFOLIACEAE.

Lonicera Halleana.
parviflora.
sempervirens.

NURSERIES AND BORDERS.

Species not represented in the other plantations.

PINACEAE.

Abies Fraseri.
subalpina.
Chamaecyparis pisifera.
Cryptomeria Japonica.
Cupressus Benthami.
Juniperus communis alpina.
Dahurica.
Suecica.
Virginiana glauca.
Larix Dahurica.
Sibirica Archangelica.
Picea alba.
Engelmannii.
nigra.
pungens.
glauca.
Pinus flexilis.
Mugho.
Murrayana.
ponderosa.
scopulorum.
rigida.

AMARYLLIDACEAE.

Narcissus Backhousei "Wm. Wilks."
Barrii conspicuus.
"Flora Wilson."
"Orpheus."
bicolor compressus.
grandis.
Horsfieldii.
Burbidgei.
"John Bain."
"Ellen Barr."
Carbularia, large sulphur yellow ex. large.
snow white ex. strong.
cernuus.
cyclamineus major.
"Golden Spur."
gracilis.
Humei "Hume's Giant."
incomparabilis "Autocrat."
Narcissus incomparabilis "Cynosure."
dble. albus plenus auranteus.
dble. albus plenus sulphureus.
dble. auranteus plenus.
"Frank Miles."
"Gwyther."
"King of the Netherlands."
"Poiteau."
"Queen Bess."
semipartitus.
"Sir Watkin."
Johnstonii "Queen of Spain."
Leedsii.
amabilis.
"Minnie Hume."
"Mrs. Langtry."
maximus.
minimus.
minor.
Nelsoni major.
obvallaris, ex. large.
odorus rugulosus.
poeticus.
ornatus, ex. large.
poetarum, ex. large.
"P. B. Barr."
princeps, ex. large.
"Santa Maria."
Scoticus, ex. large.
tortuosus.
triandrus albus, large size.
"Wm. Goldring."
"W. P. Milne."

SALICACEAE.

Populus balsamifera candicans.
Catharinae.
fastigiata.
laurifolia.
Moskoviensis.
Wobstii.
Salix amygdalina Trevoriana.

Salix Ansoniana.
cotinifolia.
viminalis regalia.

JUGLANDACEAE.

Hicoria laciniosa.

BETULACEAE.

Betula lutea.
Carpinus Betulus.

FAGACEAE.

Castanea vesca.
Quercus glandulifera.
grosseserrata.
Mongolica.
nigra.
obtusiloba.
Prinos.

ULMACEAE.

Ulmus fulva.
Sibirica.
Zelkova Richardii.

MORACEAE.

Humulus Japonicus variegatus.
Lupulus.
Morus alba.

NYMPHAEACEAE.

Castalia alba.
candidissima.
helvola.
Marliac albida.
carnea.
chromatella.
rosea.
odorata gigantea.
maxima.
minor.
sulphurea.
pygmaea.
Richardsonii.
tuberosa rosea.
Nelumbo lutea.
Nelumbo.

RANUNCULACEAE.

Atragene alpina Sibirica.
Clematis Davidiana.
Clematis ligusticifolia.
paniculata.
Paeonia anomala.
insignis.
"Peter Barr."
intermedia.
arietina.
Andersoni.
Boxteri.
Cretica.
"Diogenes."
excelsior.
"Matador."
"Northern Glory."
"Penelope."
"Purple Emperor."
"Rosy Gem."
atrorubens plena.
Bakeri.
Broteri.
coralliна.
coriacea.
decora "Gertrude."
"Ianthe."
of "Monte Gear."
humilis.
microcarpa.
officinalis alba fl. pl.
anemoneiflora.
rosa plena.
rubra plena.
"Otto Froebel."
rosea.
plena.
rubra plena.
Sabinii.
paradoxa.
fimbriata.
peregrina.
"Blushing Maid."
"Brilliant."
Byzantina.
compacta.
"Exquisite."
"Ruby Queen."
pubens.
"Russi of Sicily."
tenuifolia fl. pl.

Paeonia tenuifolia hybrida.
triternata.

BERBERIDACEAE.

Berberis repens.
rhamnifolia.

MAGNOLIACEAE.

Magnolia Fraseri.
macrophylla.
Virginiana.

SAXIFRAGACEAE.

Deutzia scabra.
Hydrangea involucrata.
Azigai.
Japonica.
virens.
Philadelphus coronarius Satsumi.

GROSSULARIACEAE.

Ribes cereum.
divaricatum.
floridum var.
nigrum.
robustum.
rubrum Brusskonaja.
sanguineum var.
saxatile.

ROSACEAE.

Cercocarpus parvifolius.
Exochorda Alberti.
Holodiscus discolor.
Kerria Japonica.
Opulaster monogyna.
Rosa "Abel Carriere."
"Alfred Colomb."
alpina.
Arkansana.
"Auguste Mie."
"Baroness Rothschild."
"Beauty of Waltham."
"Bernard Paul."
"Chas. Lamb."
"Climbing La France."
"Countess Schulenburg."
"Dr. Hooker."
"Duke of Teck."
"Empress."
Rosa Fendleri.
"Fisher Holmes."
"Geantes des Batteules."
"Geo. Washington."
"Grandeuse de Cheshunt."
"Jean Dickson."
"John Rosenkrantz."
lutea.
"Madame Gabriel Luizet."
"Magna Charta."
"Marie Bauman."
"Marshal P. Wilder."
"Monsieur Boncenne."
"Mrs. John Laing."
nitida.
"Oscar II."
"Paeonia."
"Paul Neron."
"Paxton."
"Perle des Blanches."
"Pius IX."
"Pr. C. de Rehan."
rugosa alba.
fl. pl.
setigera.
spinosissima.
tomentosa.
Wichuraiana.
Rubus caesius.
corylifolius.
dumetorum.
echinatus.
fruticosus.
fuscus.
Hystrix.
laciniatus.
leucostachys.
Lindleyanus.
longothyrsiger.
macrophyllus.
mucronatus.
mutabilis.
neglectus.
phoenicolasius.
pubescens.
radiatus.
scaber.
strigosus.

Rubus trifidus.
xanthocarpus.
Spiraea betulifolia.
Billardii.
Cantonensis.
Japonicus.
laevigata.
Regeliana.

POMACEAE.

Cotoneaster acutiloba.
frigida.
Crataegus chlorosarca.
nigrica.
pinnatifida.
pyracantha.
sanguinea.
Sinaica.
Pyrus betulifolia.
intermedia.
Japonica.
nivalis.

DRUPACEAE.

Prunus acida.
Armeniaca.
Avium multiplex.
Baldshuanica.
Chamaecerasus.
Japonica.
Laurocerasus Colchica.
Maackii.
nigra.
Pennsylvanica.
Persica.
spinosa.

CAESALPINACEAE.

Cercis Siliquastrum.
Gleditsia Sinensis.
Gymnocladus dioica.

PAPILIONACEAE.

Caragana arborescens Redowski.
frutescens.
microphylla.
pygmaea aurantiaca.
Cladrastis Amurensis var.
lutea.
Colutea arborescens purpureus.
cruenta.
Cytisus biflorus.
capitatus.
Laburnum.
purpureus.
sessilifolius.
villosus.
Genista AEthnensis.
Anglica.
scoparia.
tinctoria elatior.
virgata.
Laburnum alpinum.
biforme.
Pisum arvense.
Jomardi.
Robinia viscosa.
Vicia hirsuta.
Lowcana.
Pyrenaica.
villosa.
Vigna glabra.

BUXACEAE.

Buxus sempervirens.
Pachysandra terminalis.

ANACARDIACEAE.

Rhus trilobata.

ILICACEAE.

Ilex crenata.
Nummularia.
rotundifolia.
integra.
latifolia.
pedunculosa.

CELASTRACEAE.

Euonymus Maackii.

ACERACEAE.

Acer campestre collinum.
glabrum.
monspessulanum.
platanoides Schwedleri.
spicatum.
Tataricum.
trilobatum.

HIPPOCASTANACEAE.

AEsculus flava.
Lyoni.

SAPINDACEAE.

Koelreuteria paniculata.

RHAMNACEAE.

Ceanothus Fendleri.
ovatus.
velutinus.
Hovenia dulcis.
Rhamnus Alaternus angustifolia.
infectoria.
tinctoria.
Zizyphus vulgaris inermis.

VITACEAE.

Parthenocissus tricuspidata.

TILIACEAE.

Tilia cordata Japonica.
Mandschurica.
platyphyllos.

THEACEAE.

Actinidia Kolomikta.
polygama.

THYMELEACEAE.

Daphne Genkwa.
Mezereum.
odorum.

ELAEAGNACEAE.

Elaeagnus edulis.
Lepargyraea Canadensis.

ARALIACEAE.

Panax sessiliflorum.

UMBELLIFERAE.

Krubera leptophylla.

CORNACEAE.

Cornus sanguinea variegata.

ERICACEAE.

Andromeda cernua rubens.
Japonica.
Azalea amoena.
arborescens.
Azalea lutea.
mollis.
viscosa.
Kalmia angustifolia.
Leucothoë racemosa.
recurva.
Oxydendrum arboreum.
Rhododendron parviflorum.
Xolisma lingustrina.

CLETHRACEAE.

Clethra barbinervis.

VACCINIACEAE.

Gaylussacia resinosa.
Vaccinium corymbosum.
stamineum.

EBENACEAE.

Diospyros Virginiana.

OLEACEAE.

Fraxinus aculaefolia.
Ornus.
platycarpa.
Syringa Emodi.
Japonica.
ligustrina.
Persica.

CONVOLVULACEAE.

Ipomoea hederacea grandiflora.

BIGNONIACEAE.

Tecoma grandiflora.
radicans praecox.

CAPRIFOLIACEAE.

Diervilla Japonica.
Lonicera brachypoda.
flava.
glauca.
hispida.
involucrata.
Japonica.
glandulosa.
Tatarica.
Sambucus Canadensis.
laciniatus.
nigra.
racemosa.

Viburnum dilatatum.
Japonicum.
odoratissimum.
Oxycoccus.
tomentosum.
Wrightii.
Weigela Japonica.

CUCURBITACEAE.

Cucumus grossularioides.
Schauxii.
Cucurbita ficifolia.
Trichosanthes anguina.

COMPOSITAE.

Centaurea maritima.

TEMPORARY GREENHOUSE.

PTERIDOPHYTA.

SCHIZAEACEAE.

Lygodium Japonicum.

POLYPODIACEAE.

Adiantum hispidulum.
Asplenium sp.
Blechnum occidentale.
Cyrtomium falcatum.
Davallia sp.
Dennstaedtia dissecta.
Doodia caudata.
Dryopteris Nevadensis.
mollis.
var.
Nephrolepis cordifolia.
Pellaea hastata.
Platycerium AEthiopicum.
alcicorne.
Polypodium aureum.
Polystichum angulare.
Pteris Cretica albolineata.
ensiformis.
longifolia.
serrulata.
cristata.
tremula.
Woodwardia radicans.

CYATHEACEAE.

Alsophila australis.

SELAGINELLACEAE.

Selaginella caesia.
flabellata.
Mertensii.
sp.

SPERMATOPHYTA.

GYMNOSPERMAE.

CYCADACEAE.

Cycas circinalis.
revoluta.
Zamia integrifolia.
sp.

PINACEAE.

Abies amabilis.
grandis.
Abies nobilis.
Pinus divaricata.
Lambertina.
Sabiniana.
Pseudotsuga taxifolia.
Thuja gigantea.
Tsuga Pattoniana.

ANGIOSPERMAE.

Monocotyledones.

PANDANACEAE.

Pandanus utilis.
Veitchii.

BUTOMACEAE.

Hydrocleys nymphoides.

GRAMINEAE.

Oplismenus compositus variegatus.
Panicum (?) sp.

CYPERACEAE.

Carex Vilmoreana.
Cyperus alternifolius.
gracilis.
Kyllingia monocephala.
Scirpus sp.

PALMACEAE.

Chamaerops humilis.
Chrysalidocarpus lutescens.
Corypha australis.
Howea Belmoriana.
Forsteriana.
Latania Borbonica.
Martinezia erosa.
Neowashingtonia filifera.
Phoenix reclinata.
rupicola.
Rhapis flabelliformis.
Sabal Blackburnianum.
Trachycarpus excelsus.

ARACEAE.

Aglaeonema marmorata.
Alocasia illustris.
sp.
Anthurium Veitchii.
sp.
sp.
Dieffenbachia sp.
Monstera deliciosa.
Schismatoglottis Roebelinii.
Zantedeschia AEthiopica.

BROMELIACEAE.

Billbergia sp.
Nidularium roseum.
Tillandsia sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.

COMMELINACEAE.

Commelina communis.
Sellowiana.
Cyanotis cristata.
Zebrina pendula.

PONTEDERIACEAE.

Piaropus crassipes.

LILIACEAE.

Agapanthus sp.
Aloe delota.
Hanburiana.
subalterna. ?
succotrina.
Anthericum vestitum.
variegatum.
Beaucarnea glauca.
Cordyline terminalis.
Dracaena Lindeni.
Haworthia cymbiformis.
Sansevieria cylindrica.
gracilis.
Guineensis.
Zeylanica.
Veltheimia viridifolia.
Yucca aloifolia.

CONVALLARIACEAE.

Asparagus declinatus.
filicinus.
tenuifolius.
Aspidistra lurida.
variegata.
Myrsiphyllum medeoloides.

AMARYLLIDACEAE.

Agave Americana.
variegata.
albomarginata.
planifolia.
rigida.
Amaryllis Johnsonii.
sp. (double).
sp.
Clivia nobilis.
Crinum grandiflorum.
sp.
Curculigo recurvata.

Doryanthes excelsa.
Eucharis Amazonica.
Furcraea Cubensis.
variegata.

IRIDACEAE.

Antholyza AEthiopica.
Dietes compressa.
Melasphaerula graminea.
Sisyrinchium striatum.

MUSACEAE.

Musa Cavendishii.
nobilis.
Sapientum.
Strelitzia gigantea.
Reginae.

ZINZIBERACEAE.

Alpinia sp.
Elettaria cardamonum.
Globba Schomburgkii.

CANNACEAE.

Canna Ehmannii.

MARANTACEAE.

Maranta Kerchoviana.
rosea striata.
zebrina.
sp.
sp.
Thalia divaricata.

ORCHIDACEAE.

AErides Fieldingii.
sp.
Angraecum eburneum.
Bletia sp.
Brassia Gireoudiana.
Catasetum sp.
Cattleya amethystoglossa.
Bowringiana.
crispa.
Eldorado.
Gaskelliana.
Gigas.
labiata Warneri.
Leapoldii.
luteola.
Cattleya Percivaliana.
Schofieldiana.
speciosissima.
sp.
Coelogyne barbata.
corrugata.
cristata.
citrina.
major.
maxima.
Eldorado.
flaccida.
latifolia.
Massangeana.
ocellata.
tomentosa.
sp.
Cymbidium Hookerianum.
pendulum atropurpureum.
sp.
Cypripedium Albanense.
Ashburtoniae.
Ashburtoniae. ?
barbatum.
biflorum.
Warnerianum.
Boxallii.
callosum.
Crossianum.
Dauthieri.
Dominianum.
grande atratum.
Harrisianum.
XXX.
XXX. dark.
Haynaldianum.
hirsutissimum.
insigne.
XX.
XXX.
XXXXX. best.
albomarginatum.
Maulei.
Io.
Leeanum.
longifolium.
Lowei.
nitens.

Cypripedium Roebelenii.
Schlimii albiflorum.
Sedeni.
candidulum.
Sedeni. ?
selligerum.
Spicerianum.
XXX.
Stonei.
venustum.
XXX. dark.
sp.
sp.
sp. (yellow).
Dendrobium aggregatum.
Ainsworthii.
Brymerianum.
capillipes.
cretaceum.
Dayanum.
Farmerii.
Findleyanum.
haemoglossum.
heterocarpum.
Japonicum.
Jenkinsii.
Leechianum.
Lowii.
macrophyllum giganteum.
moniliforme.
nobile.
XXX.
XXXX.
Parishii.
primulinum.
Dendrobium suavissimum.
superbum.
tortile roseum.
Veitchianum.
Wardianum.
Diacrium bicornutum.
Epidendron coelestum.
conopseum.
nemorale.
Randii.
Rodigaseanum.
sp.
Laelia anceps.
elegans.
Gouldiana.
grandis.
purpurata.
Lycaste aromatica.
Skinneri.
Miltonia Clowesii.
Moreliana.
Oncidium Papilio.
phymatochilum.
splendidum.
Pilumna sp.
Phaius grandiflorus.
(yellow lip).
Phalaenopsis sp.
Platyclinis Cobbiana.
glumacea.
Pleione sp.
Vanilla grandifolia.
sp.
Zygopetalum Mackaii.

Dicotyledones.

PIPERACEAE.

Peperomia pellucida.
sp.

FAGACEAE.

Quercus agrifolia.
Douglasii.
lobata.

MORACEAE.

Ficus altissima.
elastica.
Ficus elastica variegata.
Indica.
repens.

URTICACEAE.

Pilea microphylla.

PROTEACEAE.

Grevillea robusta.

ARISTOLOCHIACEAE.

Aristolochia fimbriata.
sp.

POLYGONACEAE.

Muhlenbeckia platyclada.
Rumex Floridanus.
Hydrolapathum.

NYCTAGINACEAE.

Bourgainvillaea glabra Saundersiana.

PHYTOLACCACEAE.

Petiveria alliacea.
Rivina humilis.
laevis.

AIZOACEAE.

Mesembryanthemum cruciatum.
tricolorum.

PAPAVERACEAE.

Argemone Mexicana.

DROSERACEAE.

Dionaea muscipula.

CRASSULACEAE.

Bryophyllum calycinum.
sp.
Crassula lactea.
perfossa.
sp.
Echeveria Californica.
glauca major.
Peacockii.
sp.
sp.
Kalanchoë crenata.
glaucescens.
marmorata.
rosea.
Rochea falcata.
sp.
Sedum aureum.
Mexicanum.
sp.

SAXIFRAGACEAE.

Hydrangea paniculata grandiflora.
Saxifraga sarmentosa.

ROSACEAE.

Duchesnia Indica.

MIMOSACEAE.

Acacia Farnesiana.
longifolia.
sp.
sp.
Mimosa pudica.

CAESALPINACEAE.

Cassia aspera.
Chamaecrista.
occidentalis.
Tora.

PAPILIONACEAE.

AEschynomene Virginica.
Bradburya grandiflora.
Virginiana.
Clitoria Ternatea.
Dolichos Lablab.
Erythrina Crista-galli.
herbacea.
Indigofera tinctoria.
Kennedya rubicunda.
Kraunhia macrostachys.
Meibomia mollis.
Robinia sp.
Sutherlandia frutescens.

GERANIACEAE.

Pelargonium quinquevulnerum.
zonale.

OXALIDACEAE.

Oxalis Ortgiesi.

ERYTHROXYLACEAE.

Erythroxylon Coca.

CNEORACEAE.

Cneorum tricoccon.

RUTACEAE.

Citrus Aurantium.
"Otaheite."
Murraya exotica.

EUPHORBIACEAE.

Acalypha hispida.
Codiaeum interruptum.
Euphorbia Candelabrum.
cirrhiformis.

Euphorbia coerulescens.
grandicornis.
grandidens.
picta.
Grantii.
Havenensis.
Hermantiana.
heterophylla.
lactea.
nerifolia.
polygona.
serpentina.
splendens.
Williamsii.
Homalanthus Leschenaultianus.
Phyllanthus juglandifolius.
Sapium biglandulosum.

SAPINDACEAE.

Cardiospermum hirsutum.

TILIACEAE.

Entelea palmata.

MALVACEAE.

Abutilon Indicum.
pedunculare.
"Souvenir de Bonn."
venosum.
Hibiscus coccineus.
Cooperi tricolor.
Rosa Sinensis.
Malvaviscus sp.
Pavonia Wioti.

STERCULIACEAE.

Mahernia odorata.
Melochia hirsuta.
pyramidata.

THEACEAE.

Camellia Japonica.
Eurya latifolia variegata.

PASSIFLORACEAE.

Passiflora foetida.
incarnata.
sp.

CARICACEAE.

Carica Papaya.

BEGONIACEAE.

Begonia argyrostigma.
Credneri.
discolor.
Dregei.
fuchsioides.
hydrocotylifolia.
"Louise Curtis."
manicata.
metallica.
palmaris.
Rex.
semperflorens.
Verschaffeltii.
sp.
sp.

CACTACEAE.

Ariocarpus prismaticus.
Cactus Bonplandii.
Bridgesii.
colubrinus.
flavispinus.
gemmatus.
variabilis.
sp.
sp.
Cereus Baumannii.
caesius.
candicans.
colubrinus.
"De Regel."
flagelliformis.
grandiflorus.
Hamiltonii.
Jamacaru.
× grandiflorus.
lateritus.
leptophus.
McDonaldiae.
macrogonus.
Maynardi.
McDonaldii.
nycticaulis.
Olfersii.
Peruvianus.
repandus.
rostratus.
serpentinus.

Cereus speciosissimus.
splendens.
tortuosus.
triangularis.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
Echinocactus aicicornis.
Berlandieri.
brevihamatus.
caespitosus.
capricornus.
gonacanthus.
Grusoni.
LeContei.
longchanin.
maritimus.
multicostatus.
ornatus Mirobellii.
pectinatus.
pilosus.
Roemeri.
Texensis.
viridescens.
sp.
sp.
sp.
sp.
Echinopsis multiplex.
spacelata.
Zuccariuii.
sp.
sp.
Epiphyllum truncatum.
violaceum.
sp.
sp.

Epiphyllum sp.
Mammillaria applanata.
arietina.
cirrhifera longispina.
elegans.
lasiacantha.
micromeris.
minima.
nivea.
pusilla.
Stella-aurata.
sp.
Opuntia basilaris.
brachyantha.
Brasiliensis.
crinifera.
cylindrica.
dulcis.
Emoryi.
Engelmanni.
occidentalis.
Ficus-Indica.
frutescens.
fulgida.
Greggii.
Kleiniae.
leucotricha.
microdasys.
rubida.
nigricans.
polyacantha.
prolifera.
rufescens.
rutila.
serpentina.
Tuna.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.

Opuntia sp.
Pereskia Bleo.
sp.
Phyllocactus Ackermanni.
albus superbus.
anguliger.
crenatus.
Feasti.
Hookeri.
Jenkinsonii.
latifrons.
roseus superbus.
speciosus.
superbus.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
sp.
Pilocereus fossulatus.
senilis.
Rhipsalis Cassytha.
crispa.
mesembryanthoides.
pachyptera.
paradoxa.
salicornioides.
triquetrum.

LYTHRACEAE.

Lagerstroemia Indica.

COMBRETACEAE.

Combretum sp.

MYRTACEAE.

Callistemon lanceolatus.
Eucalyptus Globulus.
Eugenia sp.
Melaleuca hypericifolia.
Myrtus Ugni.
Psidium lucidum.

MELASTOMACEAE.

Heterocentron rosea.
Pleroma elegans.
Sonerila margaritacea.

ONAGRACEAE.

Fuchsia "Beauty's Bloom."
"Chas. Blanc."
"Dolly Varden."
"Flacon de Neige."
"Inimitable."
"Little Beauty."
"Mammoth Purple."
"Mrs. John Taylor."
"Oriflame."
"Phenomenal."
speciosa.
"Storm King."
"Trailing Queen."
triphylla.
"Wave of Life."
"White Phenomenal."
Jussieua decurrens.
salicifolia.

ARALIACEAE.

Hedera Helix.

CORNACEAE.

Aucuba Japonica.

PRIMULACEAE.

Cyclamen Europaeum.?
Primula Forbesii.
Sinensis stellata.

PLUMBAGINACEAE.

Plumbago sp.

EBENACEAE.

Brachycheila Horsfieldii.

OLEACEAE.

Jasminum Wallichianum.

LOGANIACEAE.

Gelsemium sempervirens.

GENTIANACEAE.

Exacum affine.

APOCYNACEAE.

Acokanthera spectabilis.
Mandevilla suaveolens.
Nerium Oleander.

Toxicophlaea sp.
Trachelospermum jasminoides.
Vinca major.
variegata.

ASCLEPIADACEAE.

Araujia sericifera.
Asclepias obovata.
Hoya carnosa.
Stapelia atrata.
grandiflora.
multiflora.
muricata.
mutabilis.
Natalensis.
parviflora.
picta.
purpurea.
scutellata.
variegata.
sp.
sp.

CONVOLVULACEAE.

Convolvulus Mauritanicus.
Ipomoea sinuata.
sp.

HYDROPHYLLACEAE.

Hydrolea spinosa.

BORAGINACEAE.

Heliotropium Peruvianum.

LABIATAE.

Coleus hybridus.
Monarda punctata.
Salvia coccinea.
lyrata.
splendens compacta.

SOLANACEAE.

Brugsmansia Knightii.
Capsicum annuum "Little Gem."
Cestrum Parqui.
Solanum aculeatissimum.
Capsicastrum.
esculentum.
Wendlandii.

SCROPHULARIACEAE.

Celsia betonicaefolia.
Maurandia Barclaiana.
Russelia juncea.
Torenia Fournieri.
Veronica imperialis.

GESNERIACEAE.

AEschynanthus sp.
Cyrtodeira metallica.
Saintpaulia ionantha.

ACANTHACEAE.

Andrographis echioides.
Eranthemum sp.
Fittonia argyroneura.
rubra.
Justicia sp.
Peristrophe speciosa.
Ruellia rosea.
Strobilanthes divaricatus.
Thyrsacanthus rutilans.

RUBIACEAE.

Luculia gratissima.
Rondeletia speciosa.

VALERIANACEAE.

Fedia lucida.

CUCURBITACEAE.

Lagenaria vulgaris.
Luffa macrocarpa.
Momordica Charantia.

CAMPANULACEAE.

Campanula pyramidalis.
Trachelium coeruleum.

COMPOSITAE.

Chrysanthemum inodorum pleniss-
simum.
Eupatorium sp.
Kleinia articulata.
Senecio multiflorus.
Stevia serrata.

LIST OF FAMILIES IN THE HERBACEOUS COLLECTION.

With the number of genera and species in each.

	Gen.	Sp.		Gen	Sp.
Acanthaceae	2	3	Globulariaceae	1	2
Aizoaceae	3	5	Gramineae	52	123
Alismaceae	1	1	Haloragidaceae	1	1
Amaranthaceae	3	10	Hydrocharidaceae	1	1
Amaryllidaceae	9	17	Hydrophyllaceae	3	5
Ambrosiaceae	3	6	Hypericaceae	2	7
Apocynaceae	3	4	Iridaceae	5	22
Araceae	7	11	Juncaceae	2	6
Araliaceae	2	3	Labiatae	36	119
Aristolochiaceae	2	5	Lentibulariaceae	1	2
Asclepiadaceae	4	15	Liliaceae	18	93
Balsaminaceae	1	4	Linaceae	1	6
Basellaceae	1	1	Loasaceae	1	2
Berberidaceae	5	5	Lobeliaceae	1	1
Boraginaceae	12	25	Lycopodiaceae	1	3
Butomaceae	1	1	Lythraceae	3	3
Cactaceae	4	12	Malvaceae	12	36
Caesalpinaceae	1	3	Marantaceae	1	1
Callitrichaceae	1	1	Martyniaceae	1	4
Campanulaceae	4	17	Melanthaceae	10	14
Cannaceae	1	1	Nolanaceae	1	1
Capparidaceae	2	5	Nyctaginaceae	2	3
Caprifoliaceae	1	2	Nymphaeaceae	1	6
Caryophyllaceae	13	86	Onagraceae	13	27
Chenopodiaceae	4	13	Ophioglossaceae	2	7
Cichoriaceae	17	58	Orchidaceae	7	14
Cistaceae	2	4	Osmundaceae	1	3
Commelinaceae	3	7	Oxalidaceae	1	7
Compositae	90	289	Papaveraceae	7	14
Convallariaceae	10	20	Papilionaceae	37	120
Convolvulaceae	2	3	Phytolaccaceae	1	2
Crassulaceae	3	26	Plantaginaceae	1	15
Cruciferae	23	53	Plumbaginaceae	3	6
Cyperaceae	5	35	Polemoniaceae	4	20
Diapensiaceae	2	2	Polygonaceae	6	40
Dipsaceae	5	23	Polypodiaceae	16	39
Droseraceae	1	1	Pontederiaceae	2	2
Equisetaceae	1	3	Portulacaceae	4	8
Ericaceae	3	3	Primulaceae	7	15
Euphorbiaceae	2	23	Pyrolaceae	2	2
Fumariaceae	2	4	Ranunculaceae	20	71
Gentianaceae	3	3	Resedaceae	1	3
Geraniaceae	3	26	Rosaceae	22	91

	Gen.	Sp.		Gen.	Sp.
Rubiaceae	8	28	Smilaceae	1	1
Rutaceae	2	3	Solanaceae	10	30
Santalaceae	1	1	Sparganiaceae	1	1
Sarraceniaceae	1	1	Tropaeolaceae	1	1
Saururaceae	1	1	Umbelliferae	30	59
Saxifragaceae	7	26	Urticaceae	3	4
Schizaeaceae	1	1	Valerianaceae	4	7
Scrophulariaceae	16	67	Verbenaceae	3	7
Selaginellaceae	1	2	Violaceae	2	38

LIST OF FAMILIES IN THE FRUTICEUM.

With the number of Genera and Species in each.

	Gen.	Sp.		Gen	Sp.
Anacardiaceae	2	5	Malvaceae	1	1
Anonaceae	1	1	Moraceae	1	1
Araliaceae	2	2	Myricaceae	2	2
Berberidaceae	1	16	Oleaceae	4	13
Betulaceae	3	8	Papilionaceae	11	17
Buxaceae	1	1	Polygonaceae	1	1
Caesalpinaceae	1	2	Pomaceae	6	10
Calycanthaceae	1	4	Ranunculaceae	2	2
Caprifoliaceae	6	39	Rhamnaceae	4	7
Celastraceae	1	6	Rosaceae	10	56
Clethraceae	1	3	Rutaceae	3	4
Compositae	2	3	Salicaceae	2	23
Cornaceae	1	7	Sapindaceae	2	2
Drupaceae	2	8	Saxifragaceae	4	15
Elaeagnaceae	3	7	Staphyleaceae	1	3
Ericaceae	10	15	Styracaceae	2	2
Fagaceae	1	1	Tamaricaceae	1	3
Grossulariaceae	1	11	Theaceae	1	1
Hamamelidaceae	2	2	Thymeleaceae	1	1
Hippocastanaceae	1	1	Trochodendraceae	1	1
Hypericaceae	1	7	Ulmaceae	2	3
Ilicaceae	1	4	Vacciniaceae	2	2
Lauraceae	1	1	Verbenaceae	3	4
Loganiaceae	1	1			

LIST OF FAMILIES IN THE ARBORETUM

(INCLUDING THE PINETUM).

With the number of Genera and Species in each.

	Gen.	Sp.		Gen.	Sp.
Aceraceae	1	10	Araliaceae	2	4
Anacardiaceae	2	3	Betulaceae	4	12

	Gen.	Sp.		Gen.	Sp
Bignoniaceae	1	1	Oleaceae	1	10
Caesalpinaceae	1	1	Papilionaceae	1	1
Caprifoliaceae	1	2	Pinaceae	6	14
Cornaceae	2	3	Platanaceae	1	2
Drupaceae	1	9	Pomaceae	5	22
Fagaceae	3	15	Rutaceae	2	3
Gingkoaceae	1	1	Salicaceae	2	6
Hamamelidaceae	1	1	Scrophulariaceae	1	1
Hippocastanaceae	1	2	Simarubaceae	1	1
Ilicaceae	1	1	Styracaceae	1	2
Juglandaceae	2	9	Taxaceae	1	6
Lauraceae	1	1	Tiliaceae	1	2
Magnoliaceae	2	5	Trochodendraceae	1	1
Moraceae	3	3	Ulmaceae	2	6

LIST OF FAMILIES IN VITICETUM.

With the number of Genera and Species in each.

	Gen.	Sp		Gen.	Sp.
Aristolochiaceae	1	1	Papilionaceae	2	4
Asclepiadaceae	1	1	Passifloraceae	1	1
Caprifoliaceae	1	3	Polygonaceae	1	1
Celastraceae	1	3	Ranunculaceae	1	8
Convolvulaceae	2	3	Rosaceae	1	3
Dilleniaceae	1	1	Smilaceae	1	1
Dioscoreaceae	1	1	Solanaceae	2	2
Lardizabalaceae	1	1	Vitaceae	3	8
Menispermaceae	2	3			

LIST OF FAMILIES IN THE NURSERIES AND BORDERS.

Species not represented in other plantations. With the number of Genera and Species in each.

	Gen.	Sp.		Gen.	Sp.
Aceraceae	1	7	Clethraceae	1	1
Amaryllidaceae	1	51	Compositae	1	1
Anacardiaceae	1	1	Convolvulaceae	1	1
Araliaceae	1	1	Cornaceae	1	1
Berberidaceae	1	2	Cucurbitaceae	3	4
Betulaceae	2	2	Drupaceae	1	12
Bignoniaceae	1	2	Ebenaceae	1	1
Buxaceae	2	2	Elaeagnaceae	2	2
Caesalpinaceae	3	3	Ericaceae	7	13
Caprifoliaceae	5	20	Fagaceae	2	7
Celastraceae	1	1	Grossulariaceae	1	8

	Gen.	Sp.
Hippocastanaceae	1	2
Ilicaceae	1	6
Juglandaceae	1	1
Magnoliaceae	1	3
Moraceae	2	3
Nymphaeaceae	2	16
Oleaceae	2	7
Papilionaceae	10	29
Pinaceae	8	22
Pomaceae	4	13
Ranunculaceae	3	52
Rhamnaceae	4	8
Rosaceae	8	75
Salicaceae	2	10
Sapindaceae	1	1
Saxifragaceae	3	6
Theaceae	1	2
Thymeleaceae	1	3
Tiliaceae	1	3
Ulmaceae	2	3
Umbelliferae	1	1
Vacciniaceae	2	3
Vitaceae	1	1

LIST OF FAMILIES IN THE TEMPORARY GREEN-HOUSE.

With the number of Genera and Species in each.

	Gen.	Sp.
Acanthaceae	8	9
Aizoaceae	1	2
Amaryllidaceae	8	16
Apocynaceae	6	6
Araceae	7	10
Araliaceae	1	1
Aristolochiaceae	1	2
Asclepiadaceae	4	16
Begoniaceae	1	15
Boraginaceae	1	1
Bromelinaceae	3	10
Butomaceae	1	1
Cactaceae	12	160
Caesalpinaceae	1	4
Campanulaceae	2	2
Cannaceae	1	1
Caricaceae	1	1
Cneoraceae	1	1
Combretaceae	1	1
Commelinaceae	3	4
Compositae	5	5
Convallariaceae	3	6
Convolvulaceae	2	3
Cornaceae	1	1
Crassulaceae	6	19
Cucurbitaceae	3	3
Cyatheaceae	1	1
Cycadaceae	2	4
Cyperaceae	4	5
Droseraceae	1	1
Ebenaceae	1	1
Erythroxylaceae	1	1
Euphorbiaceae	6	21
Fagaceae	1	3
Gentianaceae	1	1
Geraniaceae	1	2
Gesneriaceae	3	3
Gramineae	2	2
Hydrophyllaceae	1	1
Iridaceae	4	4
Labiatae	3	5
Liliaceae	10	17
Loganiaceae	1	1
Lythraceae	1	1
Malvaceae	4	9
Marantaceae	2	6
Melastomaceae	3	3
Mimosaceae	2	5
Moraceae	1	5
Musaceae	2	5
Myrtaceae	6	6
Nyctaginaceae	1	1
Oleaceae	1	1
Onagraceae	2	18
Orchidaceae	23	132
Oxalidaceae	1	1
Palmaceae	11	13
Pandanaceae	1	2

	Gen.	Sp.		Gen.	Sp.
Papaveraceae	1	1	Rutaceae	2	3
Papilionaceae	11	13	Sapindaceae	1	1
Passifloraceae	1	3	Saxifragaceae	2	2
Phytolaccaceae	2	3	Schizaeaceae	1	1
Pinaceae	5	9	Scrophulariaceae	5	5
Piperaceae	1	2	Selaginellaceae	1	4
Plumbaginaceae	1	1	Solanaceae	4	7
Polygonaceae	2	3	Sterculiaceae	2	3
Polypodiaceae	15	22	Theaceae	2	2
Pontederiaceae	1	1	Tiliaceae	1	1
Primulaceae	2	3	Urticaceae	1	1
Rosaceae	1	1	Valerianaceae	1	1
Rubiaceae	2	2	Zinziberaceae	3	3

LIST OF FAMILIES UNDER CULTIVATION IN THE VARIOUS PLANTATIONS.

With the number of Genera and Species in each.

	Gen.	Sp.		Gen.	Sp.
Acanthaceae	8	12	Calycanthaceae	1	4
Aceraceae	1	17	Campanulaceae	3	19
Aizoaceae	3	7	Cannaceae	1	2
Alismaceae	1	1	Capparidaceae	2	5
Amaranthaceae	3	10	Caprifoliaceae	10	66
Amaryllidaceae	14	83	Caricaceae	1	1
Ambrosiaceae	3	6	Caryophyllaceae	13	90
Anacardiaceae	3	9	Celastraceae	1	11
Anonaceae	1	1	Chenopodiaceae	4	13
Apocynaceae	8	10	Cichoriaceae	17	58
Araceae	14	21	Cistaceae	2	4
Araliaceae	6	11	Clethraceae	1	4
Aristolochiaceae	3	8	Cneoraceae	1	1
Asclepiadaceae	8	32	Combretaceae	1	1
Balsaminaceae	1	4	Commelinaceae	5	10
Basellaceae	1	1	Compositae	93	298
Begoniaceae	1	15	Convallariaceae	12	26
Berberidaceae	6	23	Convolvulaceae	2	12
Betulaceae	7	22	Cornaceae	3	12
Bignoniaceae	2	3	Crassulaceae	8	45
Boraginaceae	12	26	Cruciferae	23	53
Bromeliaceae	3	10	Cucurbitaceae	6	7
Butomaceae	1	1	Cyatheaceae	1	1
Buxaceae	2	3	Cycadaceae	2	4
Cactaceae	12	172	Cyperaceae	6	40
Caesalpinaceae	4	12	Diapensiaceae	2	2
Callitrichaceae	1	1	Dilleniaceae	1	1

	Gen.	Sp.		Gen.	Sp.
Dioscoreaceae	1	1	Mimosaceae	2	5
Dipsaceae	5	23	Moraceae	5	12
Droseraceae	2	2	Musaceae	2	5
Drupaceae	1	29	Myricaceae	2	2
Ebenaceae	2	2	Myrtaceae	6	6
Elaeagnaceae	3	9	Nolanaceae	1	1
Equisetaceae	1	3	Nyctaginaceae	3	4
Ericaceae	15	31	Nymphaeaceae	2	22
Erythroxylaceae	1	1	Oleaceae	6	31
Euphorbiaceae	7	44	Onagraceae	15	45
Fagaceae	3	26	Ophioglossaceae	2	7
Fumariaceae	2	4	Orchidaceae	30	146
Gentianaceae	4	4	Osmundaceae	1	3
Geraniaceae	3	28	Oxalidaceae	1	8
Gesneriaceae	3	3	Palmaceae	11	13
Gingkoaceae	1	1	Pandanaceae	1	2
Globulariaceae	1	2	Papaveraceae	7	15
Gramineae	53	125	Papilionaceae	59	173
Grossulariaceae	1	19	Passifloraceae	1	3
Haloragidaceae	1	1	Phytolaccaceae	3	5
Hamamelidaceae	2	2	Pinaceae	13	44
Hippocastanaceae	1	5	Piperaceae	1	2
Hydrocharidaceae	1	1	Plantaginaceae	1	15
Hydrophyllaceae	4	6	platanaceae	1	2
Hypericaceae	2	12	Plumbaginaceae	3	7
Ilicaceae	1	11	Polemoniaceae	4	20
Iridaceae	8	26	Polygonaceae	8	45
Juglandaceae	3	10	Polypodiaceae	25	60
Juncaceae	2	6	Pomaceae	15	45
Labiatae	37	123	Pontederiaceae	2	2
Lardizabalaceae	1	1	Portulacaceae	4	8
Lauraceae	2	2	Primulaceae	8	18
Lentibulariaceae	1	2	Pyrolaceae	2	2
Liliaceae	27	110	Ranunculaceae	22	132
Linaceae	1	6	Resedaceae	1	3
Loasaceae	1	2	Rhamnaceae	5	15
Lobeliaceae	1	1	Rosaceae	33	228
Loganiaceae	2	4	Rubiaceae	10	30
Lycopodiaceae	1	3	Rutaceae	8	13
Lythraceae	4	4	Salicaceae	2	38
Magnoliaceae	2	8	Santalaceae	1	1
Malvaceae	13	46	Sapindaceae	4	4
Marantaceae	2	7	Saraceniaceae	1	1
Martyniaceae	1	4	Sauruaceae	1	1
Melanthaceae	10	14	Saxifragaceae	11	48
Melastomaceae	3	3	Schizaeaceae	1	2
Menispermaceae	2	3	Scrophulariaceae	20	73

	Gen.	Sp.
Selaginellaceae	1	6
Simarubaceae	1	1
Smilaceae	1	2
Solanaceae	14	37
Sparganiaceae	1	1
Staphyleaceae	1	3
Sterculiaceae	2	3
Styracaceae	3	4
Tamaricaceae	1	3
Taxaceae	1	6
Theaceae	4	5
Thymeleaceae	1	4
Tiliaceae	2	6
Trochodendraceae	1	1
Tropaeolaceae	1	1
Ulmaceae	5	12
Umbelliferae	31	60
Urticaceae	4	5
Vacciniaceae	3	5
Valerianaceae	4	8
Verbenaceae	6	11
Violaceae	2	38
Vitaceae	3	9
Zinziberaceae	3	3
Families 172	1059	3692
Wild Flora, species not represented in any of the plantations		328
Total species and varieties		4020

WILD FLORA.

(Additions to the List published in Bulletin No. 4.)

Subkingdom 3.—BRYOPHYTA.

EPHEMERACEAE.

Ephemerum spinulosum.

BRUCHIACEAE.

Pleuridium subulatum.

WEISIACEAE.

Weisia viridula.
Astomum crispum.

DICRANACEAE.

Dicranella heteromalla orthocarpa.
minor.
Dicranum fulvum.
montanum.

LEUCOBRYACEAE.

Leucobryum glaucum albidum.

FISSIDENTACEAE.

Fissidens adiantoides.
minutulus.

DITRICHACEAE.

Ditrichum tortile pusillum.

POTTIACEAE.

Pottia truncatula.
Tortula muralis.

GRIMMIACEAE.

Grimmia pilifera.
apocarpa.
rivularis.

ORTHOTRICHACEAE.

Orthotrichum fallax.
Braunii.

BRYACEAE.

Bryum albicans.
bimum.
capillare.
proliferum.
Mnium affine rugicum.
rostratum.
hornum.
Aulacomnium heterostichum.
palustre.
Bartramia pomiformis.

POLYTRICHACEAE.

Catharinea undulata.

GEORGIACEAE.

Georgia pellucida.

FONTINALACEAE.

Dichelyma capillaceum.

LESKEACEAE.

Anomodon rostratus.
tristis.
Thelia hirtella.

THUIDIACEAE.

Thuidium delicatulum.

ISOTHECIACEAE.

Entodon seductrix.

BRACHYTHECIACEAE.

Brachythecium Novae-Angliae.
populeum.
rutabulum.

HYPNACEAE.

Eurhynchium strigosum.
Rhonchostegium serrulatum.
Plagiothecium denticulatum pusillum.
forma propagulifera.
elegans filamentosa.
sylvaticum propagulifera.
striatellum.
Amblystegium riparium.
abbreviatum.
fluviatile.
varium.
minutissimum.
Hypnum chrysophyllum.
cordifolium.
cupressiforme var.
Patientiae.

Subkingdom 4.—PTERIDOPHYTA.

OPHIOGLOSSACEAE.

Botrychium obliquum.

POLYPODIACEAE.

Dryopteris cristata.

Subkingdom 5.—SPERMATOPHYTA.

PINACEAE.

Picea Mariana.

GRAMINEAE.

Aristida gracilis.
Panicum Ashei.

LILIACEAE.

Allium Canadense.

JUGLANDACEAE.

Hicoria glabra.

POLYGONACEAE.

Rumex Britannica.

CARYOPHYLLACEAE.

Dianthus Armeria.

RANUNCULACEAE.

Batrachium trichophyllum.
Ranunculus abortivus.

CRUCIFERAE.

Arabis laevigata.

SAXIFRAGACEAE.

Chrysosplenium Americanum.

GERANIACEAE.

Geranium Carolinianum.

OXALIDACEAE.

Oxalis stricta.

CALLITRICHACEAE.

Callitriche palustris.

VERBENACEAE.

Verbena hastata.

SCROPHULARIACEAE.

Chelone glabra.

PLANTAGINACEAE.

Plantago major.

LOBELIACEAE.

Lobelia Canadensis.
cardinalis.

CICHORIACEAE.

Hieracium scabrum.

ACCESSIONS OF MATERIAL.

Plants.

	Specimens.
W. E. Britton, *Rubus rosaefolius*, exchange,.....	2
Bobbink & Atkins, tree paeonies, collection, purchased,....	75
Theo. Holm, *Pinus Virginiana*, donated, ...	1
H. A. Dreer, collection, purchased,.....	28
T. Meehan & Sons, collection of Conifers, purchased,.	220
Edw. Gillett, herbaceous perennials, ...	225
L. Boehmer, collection of Japanese shrubs, purchased,.....	251
W. Elliott & Sons, roses and other shrubs, purchased,.....	220
Henry A. Smith, *Tipularia unifolia*, donated,.....	1
S. C. Moon, collection, purchased,.....	135
D. T. MacDougal, *Aplectrum spicatum*, donated,.....	200
N. L. Britton, herbaceous perennials collected at Bedford, donated, ...	3
D. T. MacDougal, herbaceous perennials, collection, donated, ...	75
W. T. Brotherton, *Allium* sps., donated,.....	4
N. L. Britton, herbaceous perennials, donated,.....	7
N. L. Britton, *Cyperus esculentus*, donated,.....	1
W. N. Clute, ferns, donated, ...	4
Marion Satterlee, ferns, donated,.....	3
Minnesota Agricultural Experiment Station, seedlings of trees and shrubs, donated,.....	800
David G. Gates & Co., Dawson pine, donated,.....	1
H. H. Rusby, herbaceous perennials, donated,.....	4
J. H. Maghee, Canadian Yews, donated,.....	12
Chas. Patin, orchids from U. S. of Colombia, donated, ...	6
Mrs. C. A. Wood, *Cypripedium regina*, donated,.....	3
Wm. N. Clark, *Dionaea muscipula*, donated,.....	3
E. E. Olcott, *Euphorbia*, donated,.....	1
J. F. Cowell, white-leaved willow, donated,.....	1
F. L. Fenno, *Ledum Groenlandicum*, donated,.....	2
C. E. Bessey, Cacti, donated,.....	4
Mr. Dempke, herbaceous perennials, exchange,.....	4
Miss Emma J. Cole, *Viola ovata* from Michigan, donated,	45
L. M. Underwood, *Isoetes* sp., Connecticut, donated,.....	1
Miss Frances M. Abbott, grasses from New Hampshire, donated, ...	3

	Specimens.
H. P. Kelsey, *Lilium Carolinianum*, donated,.....	1
N. L. Britton, herbaceous perennials from Columbus, Ohio, donated, ...	10
F. E. Lloyd, *Quamassia esculenta*, donated, ...	1
L. M. Underwood, *Marsilia quadrifolia* from Connecticut, donated, ...	5
Geo. V. Nash, herbaceous perennials, donated,.....	14
J. F. Huss, Conifers from the Berkshires, donated,.....	4
Miss Marshall, herbaceous perennials, donated,.....	2
F. C. Seible, *Echeverias* and *Marantas*, donated,.....	40
D. T. MacDougal, *Philotria* sp. from Minnesota, donated,	1
A. Riedinger, Oleander, rubber plants, etc., donated,.....	13
S. Henshaw, *Centaurea maritima*, donated,.....	1
G. N. Best, *Isoetes Dodgei* from Pennsylvania, donated,	2
G. N. Best, *Pinus pungens*, donated,.....	10
H. P. Kelsey, hardy plants, donated,.....	438
H. S. Wood, hardy perennials, donated (J. W. Duncan),..	450
C. L. Pollard, *Lygodium palmatum*, donated,.....	1
C. D. Fretz, Violets, purchased,.....	3
E. S. Miller, Cacti, etc., donated,.....	50
J. L. Childs, Lilies, purchased,.....	144
Mrs. Mace, greenhouse plants, donated,.....	4
Mr. Scheninger, " " "	4
S. W. Harriot, " " "	3
Dr. Spruce, " " "	3
Mr. Thayer, " " "	8
Mr. Cleary, " " "	1
Peter Henderson & Son, miscellaneous bulbs, donated,.....	3,000
By germination from Berlin seed, secured by exchange,.....	2,000
" " " Cambridge seed, secured by exchange,	2,600
" " " Smith College seed, secured by exchange, ...	400
	11,558

Seeds.

	Packets.
Royal Botanic Garden, Berlin, by exchange,.....	1,600
T. D. A. Cockerell, *Linum* from Organ Mountains, donated, and seeds from Arizona, donated,.....	3
Peter Henderson & Co., miscellaneous collection, donated,..	50

	Specimens.
Cambridge Botanic Garden, by exchange,.....	2,000
Chas. Patin, from U. S. of Colombia, donated,.....	9
Boston Fruit Co., cocoanuts in husk, donated,.....	100
C. E. Bessey, *Cactus*, donated,.....	2
Miss H. S. Wingate, *Amoena* from Cuba, donated,.....	2
Prof. C. S. Williamson, collection, donated, ...	36
Wm. Saunders, Canadian plants, donated,.....	10
J. S. Childs, collection, purchased,.....	500
L. H. Lighthipe, collection, purchased,.....	103
Weeber & Don, perennials, purchased,.....	74
D. S. Johnson, *Monotropa uniflora*, donated,.....	2
	4,491

SCHEDULE OF EXPENDITURES DURING 1899 UNDER APPROPRIATIONS MADE BY THE BOARD OF MANAGERS.

City Maintenance Account.....$30,000.00

Salaries and Labor.

Appropriated	$26,268.29
Expended.....	26,268.29

Supplies.

Appropriated.....	3,731.71
Expended.....	3,730.21
Balance	1.50

Garden Accounts.

Equipment of Stable.

Appropriated.....		850.00
Expended.....		821.88
Balance.....		28.12

Engineering Advice.

Appropriated.....	200.00	
Transferred from Appropriation for Museum and Herbarium Material	5.00	205.00
Expended.....	165.00	
Transferred to Appropriation for Special Assistance	40.00	205.00

Purchase and Collection of Plants.

Appropriated.....	300.00	
Transferred from Appropriation for Publications	40.00	
Transferred from Appropriation for Museum and Herbarium Material.....	5.00	345.00
Expended.....		340.86
Balance.....		4.14

Operating Temporary Greenhouse.

Appropriated	300.00
Expended	226.69
Balance	73.31

Circulars and Notices to Annual Members.

Appropriated	400.00
Expended	394.21
Balance	5.79

Museum and Herbarium Material.

Appropriated	$ 2,500.00	
Transferred from Appropriation for Ornamentation End Pavilions of Museum..	500.00	3,000.00
Expended	2,840.46	
Transferred to Appropriation for Grading and Drainage	125.00	
Transferred to Appropriation for Purchase and Collection of Plants	5.00	
Transferred to Appropriation for Engineering Advice	5.00	2,975.46
Balance		24.54

Lectures.

Appropriated		150.00
Expended	108.00	
Transferred to Appropriation for Library ..	42.00	150.00

Publications.

Appropriated		500.00
Expended	458.11	
Transferred to Appropriation for Purchase and Collection of Plants	40.00	498.11
Balance		1.89

Library.

Appropriated	600.00	
Transferred from Appropriation for Lectures	42.00	
		642.00
Expended		639.50
Balance		2.50

Rent of Bedford Park House.

Appropriated		455.00
Expended		455.00

Special Assistance.

Appropriated	400.00	
Transferred from Appropriation for Engineering Advice.....	40.00	
		440.00
Expended		436.00
Balance		4.00

Contingent Fund.

Appropriated	1,100.00
Expended	1,097.10
Balance	2.90

Plans.

Appropriated	750.00
Expended	750.00

Water Pipe.

Appropriated	3,000.00	
Transferred from Appropriation for Telephone Cable, Museum to Power House	147.20	
		3,147.20
Expended		3,142.03
Balance		5.17

Equipment of the Laboratories.

Appropriated	1,000.00
Expended	997.11
Balance	2.89

Telephone Cable, Museum to Power House.

Appropriated	147.20
Transferred to Appropriation for Water Pipe.....	147.20

Ornamentation End Pavilions of Museum.

Appropriated	500.00
Transferred to Appropriation for Museum and Herbarium Material.....	500.00

Grading and Drainage.

Appropriated	1,000.00	
Transferred from Appropriation for Museum and Herbarium Material.....	125.00	
		1,125.00
Expended		1,123.79
Balance		1.21
Total Appropriated for Garden Accounts.....		$14,152.20
Total Expended for Garden Accounts.....		13,995.74
Balance		$ 156.46

SPECIAL BOOK FUND.

Subscriptions	$4,950.00
Expenditures.....	1,916.65
Balance	$3,033.35

PUERTO RICO FUND—SPECIAL.

Appropriated 1898.....		$ 750.00
Returned by N. L. B.....		350.00
Expended 1898.....	$1,071.00	
Appropriated 1899.....		750.00
Returned by N. L. B.....		87.37
Expended 1899.....	866.37	
	$1,937.37	$1,937.37

REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND MEMBERS.

(*Presented and Accepted January, 8, 1900.*)

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen:

The number of new annual members who have qualified during the past year is 165.

The total number of annual members is now 715.

Of these 6 are in arrears for dues for 1899; 7 are in arrears for dues for 1898 and 1899; and 2 are in arrears for dues for 1897, 1898 and 1899.

Annual dues have been collected to the amount of $7,200, which has been transmitted to the Treasurer as received.

One person has qualified as Patron by the payment of $5,000. Two persons have qualified as Fellows by the payment of $1,000 each, and 67 as Life Members by the payment of $100 each. These sums have been transmitted to the Treasurer for credit to the Endowment Fund.

A complete list of Patrons, Fellows, Life Members, and Annual Members to date is herewith submitted.

NEW YORK, January 8, 1900.

PATRONS.

Hon. Addison Brown,
Andrew Carnegie,
Columbia College,
James M. Constable,
* Hon. Chas. P. Daly,
Wm. E. Dodge,
Geo. J. Gould,
Helen M. Gould,
Mrs. Esther Herrman,
John S. Kennedy,
D. O. Mills,
J. Pierpont Morgan,
Oswald Ottendorfer,
James R. Pitcher,
John D. Rockefeller,
William Rockefeller,
Wm. C. Schermerhorn,
Jas. A. Scrymser,
Samuel Sloan,
* Cornelius Vanderbilt,
Mrs. Antoinette Eno Wood.

* Deceased.

Fellows.

Mrs. Melissa P. Dodge,
C. P. Huntington,
David B. Ivison,
Morris K. Jesup,
John Innes Kane,
Hon. Seth Low,
F. F. Thompson,
Samuel Thorne,
Tiffany & Co.,
H. C. von Post.

Life Members.

Edward D. Adams,
Mrs. James Herman Aldrich,
Richard H. Allen,
Samuel P. Avery,
Samuel D. Babcock,
Dr. John Hendley Barnhart,
Samuel R. Betts,
George C. Boldt,
Frederic Bronson,
E. Dwight Church,
Geo. C. Clark,
Banyer Clarkson,
Melville C. Day,
Miss Julia L. Delafield,
Maturin L. Delafield, Jr.,
Miss Ethel Du Bois,
Miss Katharine Du Bois,
Wm. A. Du Bois,
Newbold Edgar,
David L. Einstein,
Ambrose K. Ely,
Edward J. Farrell,
Andrew Fletcher,
Col. DeLancey Floyd-Jones,
James B. Ford,
Mrs. Theodore Kane Gibbs,
James J. Goodwin,
J. B. M. Grosvenor,
Bernard G. Gunther,
Frederic R. Halsey,
H. O. Havemeyer,
Very Rev. E. A. Hoffman,
George B. Hopkins,
Adrian Iselin,
Theo. F. Jackson,
Dr. E. G. Janeway,
Walter R. T. Jones,
Eugene Kelly,
W. B. Kunhardt,
Mrs. George Lewis,
W. H. Lewis, Jr.,
Joseph Loth,
David Lydig,
Wm. H. Macy, Jr.,
Edgar L. Marston,
A. G. Mills,
Roland G. Mitchell,
John G. Moore,
A. Lanfear Norrie,
Gordon Norrie,
Geo. M. Olcott,
Geo. Foster Peabody,
James Tolman Pyle,
M. Taylor Pyne,
Geo. W. Quintard,
Jacob Monroe Rich,
H. H. Rogers,
Reginald H. Sayre,
Edward C. Schaefer,
Isaac N. Seligman,
Francis L. Stetson,
Miss C. Phelps Stokes,
Miss Olivia E. Phelps Stokes,
Wm. Stewart Tod,

Spencer Trask,
Miss Susan Travers,
Henry Freeman Walker, M.D.,
John I. Waterbury,
John D. Wing,

Annual Members.

Robert Abbe, M.D.,
A. G. Agnew,
Mrs. Cornelius R. Agnew,
John T. Agnew,
C. L. Allen,
Wm. C. Alpers,
Bernard G. Amend,
John A. Amundson,
J. M. Andreini,
J. Sherlock Andrews,
Miss Mary Appleton,
John D. Archbold,
James Armstrong,
Francis B. Arnold,
Edmund S. F. Arnold, M.D.,
Reginald H. Arnold,
Hugh D. Auchincloss,
John W. Auchincloss,
George C. Austin,
Samuel P. Avery, Jr.,
Mrs. Elizabeth Bache,
Mrs. N. P. Bailey,
Frederic Baker,
Geo. V. A. Baldwin,
Robert F. Ballantine,
Ewald Balthasar,
Amzi Lorenzi Barber,
Henry I. Barbey,
E. W. Barnes,
John S. Barnes,
Chas. T. Barney,
William Barr,
E. W. Bass,
Chas. Batchelor,
Thos. H. Bauchle,
Alfred N. Beadleston,
Chas. C. Beaman,
Gerard Beekman,
M. H. Beers,
August Belmont,
Geo. H. Bend,
James H. Benedict,
Jno. R. Bennett,
Mrs. Adolph Bernheimer
Chas L. Bernheimer,
Simon Bernheimer,
Simon E. Bernheimer,
Edward J. Berwind,
Henry Beste,
Francesco Bianchi,
Eugene P. Bicknell,
L. Horatio Biglow,
Isaac Bijur,
Miss Elizabeth Billings,
Geo. Blagden,
Mrs. Birdseye Blakeman,
Louis H. Blakeman,
Mrs. S. A. Blatchford,
Geo. T. Bliss,
Jno. H. Bloodgood,
Lyman G. Bloomingdale,
Albert G. Bogert,
Frank S. Bond,
G. T. Bonner,
Hon. H. W. Bookstaver,
Geo. S. Bowdoin,
John M. Bowers,
J. Bramwell,
Michael Brennan,
M. P. Breslin,

Miss Cornelia G. Brett,
Mrs. Benjamin Brewster,
Marvin Briggs,
Chas. Astor Bristed.
John I. D. Bristol,
W. F. Brittain,
Mrs. Harriet Lord Britton,
Mrs. Kate M. Brookfield,
John Crosby Brown,
Robert Brown,
W. L. Brown,
W. P. Brown,
F. W. Bruggerhof,
H. B. Brundrett,
Mrs. William Bryce,
William Bryce, Jr.,
W. Buchanan,
Albert Buchman,
James Buckhout,
Wm. Allen Butler,
John Cabot, M.D.,
John L. Cadwalader,
George Calder,
Emil Calman,
Henry L. Calman,
W. L. Cameron,
H. H. Cammann,
Henry L. Cammann,
S. T. Cannon,
Mrs. Miles B. Carpenter,
James C. Carter,
Walter S. Carter,
W. Caspary,
John W. Castree,
John H. Caswell,
Frank R. Chambers,
Chester W. Chapin,
Geo. E. Chisolm,
Mrs. Wm. E. Chisolm,
Jared Chittenden,
Wm. G. Choate,
W. F. Chrystie,
John K. Cilley,
John Claflin,
J. Mitchell Clark,
William N. Clark,
C. C. Clarke,
Frederick Clarkson,
Wm. J. Coates, M.D.,
Wm. F. Cochran,
John W. Cochrane,
Miss Mary F. Cockcroft,
C. A. Coffin,
Chas. H. Coffin,
Edmund Coffin,
E. W. Coggeshall,
Samuel M. Cohen,
N. A. Colburn,
Mrs. James B. Colgate,
P. F. Collier,
F. Collingwood,
Miss Ellen Collins,
Mrs. Wm. Combe,
Alexander T. Compton,
Roland R. Conklin,
Wm. L. Conyngham,
C. F. Cook,
Mrs. C. T. Cook,
Henry H. Cook,
Edward Cooper,
Geo. Coppell,
C. H. Coster,
Chas. J. Coulter,
Albert Crane,
Geo. F. Crane,
Jonathan H. Crane,
Mrs. Jonathan H. Crane,
Francis Crawford,
Robert L. Crawford,
H. G. Crickmore,

John D. Crimmins,
Frederic Cromwell,
Jas. W. Cromwell,
Edwin A. Cruikshank,
Chas. Curie,
Chas. B. Curtis,
Ira Davenport,
Wm. Gilbert Davies,
Clarence S. Day,
H. de Coppet,
Richard Deeves,
Robert W. De Forest,
D. Bryson Delavan, M.D.,
Charles de Rham,
Thos. J. de Sabla,
Theo. L. De Vinne,
F. W. Devoe,
W. B. Dickerman,
Chas. D. Dickey,
Mrs. Hugh T. Dickey,
Geo. H. Diehl,
Chas. F. Dieterich,
Miss Mary A. Dill,
Mrs. Henry F. Dimock,
Morgan Dix,
Cleveland H. Dodge,
D. Stuart Dodge,
Geo. E. Dodge,
Miss Grace H. Dodge,
Mrs. Wm. E. Dodge,
Mrs. Wm. E. Dodge, Jr.,
C. W. Doherty,
L. F. Dommerich,
Mrs. Henry Dormitzer,
James Douglass,
Tracy Dows,
John J. Drake,
Matthew B. DuBois,
John P. Duncan,
Edward K. Dunham,
George H. Dunham,
S. Whitney Dunscomb, Jr.,
Frank J. Dupignac,
H. A. Du Pont,
John S. Durand,
J. B. Dutcher,
Mrs. John Dwight,
Thomas Dwyer,
Dorman B. Eaton,
Jarvis B. Edson,
Miss Laura Jay Edwards,
Henry G. Eilshemins,
August Eimer,
Mrs. Matilda A. Elder,
Geo. W. Ellis,
John W. Ellis,
J. M. Ellsworth,
Wm. Ellsworth,
Wm. W. Ellsworth,
John J. Emery,
C. Temple Emmet,
Robert Temple Emmet,
John C. Eno,
Louis Ettlinger,
Richard Evans,
E. Eyre,
H. C. Fahnestock,
Thos. H. Faile,
Samuel W. Fairchild,
Jas. C. Fargo,
B. Fischer,
Mrs. Josiah M. Fiske,
Stephen Fiske,
Mrs. Louis Fitzgerald,
Wm. L. Flanagan,
Isaac D. Fletcher,
Miss Helena Flint,
A. R. Flower,
J. D. Flower,
Edw. W. Foster,

Mrs. A. Frankfield,
Estate of Henry Gade,
John A. Garver,
Mrs. Martha F. Gay,
Joseph E. Gay,
William H. Gebherd,
S. J. Geoghegan,
John J. Gibbons,
Mrs. Hervey de Blois Gibson,
R. W. Gibson,
George Gill,
Peter C. Gillings,
Georges A. Glaenzer,
Frederic N. Goddard,
W. A. Goddard,
Chas. H. Godfrey,
Mrs. Edwin L. Godkin,
Mrs. Frederic Goodridge,
E. Read Goodridge,
Francis Goodwin,
Miss Theodora Gordon,
Edwin Gould,
Hon. Wm. R. Grace,
Malcolm Graham,
Henry Graves,
John Clinton Gray,
Ernest F. Greeff,
John Greenough,
Isaac J. Greenwood,
Rev. David H. Greer,
Daniel J. Griffith,
E. Morgan Grinnell,
Chester Griswold,
W. C. Gulliver,
W. S. Gurnee,
W. S. Gurnee, Jr.,
John A. Hadden,
J. and M. Haffen,
James D. Hague,
Miss Laura P. Halsted,
Wm. Hamann,
Miss Adelaide Hamilton,
Chas. T. Harbeck,
J. Montgomery Hare,
S. W. Harriot,
William Hamilton Harris,
Marcellus Hartley,
Jacob Hasslacher,
Miss Mary R. Hatch,
Louis Haupt, M.D.,
J. C. Havemeyer,
G. G. Haven,
J. Woodward Haven,
R. Somers Hayes,
Arthur H. Hearn,
John G. Heckscher,
L. A. Heinsheimer,
Homer Heminway,
Chas. R. Henderson,
Jos. J. Henderson,
Edmund Hendricks,
Samuel Henshaw,
Hon. Abram S. Hewitt,
James J. Higginson,
Geo. R. Hill,
James K. Hill,
Wm. K. Hinman,
John H. Hinton, M.D.,
B. Hochschild,
Mrs. George Hoffman,
Abbott Hodgman, M.D.,
E. B. Holden,
E. R. Holden,
Henry Holt,
Isaac A. Hopper,
Burrett W. Horton,
G. H. Houghton,
Lucius W. How, M.D.,
Alfred M. Hoyt,
Gerald L. Hoyt,

Samuel N. Hoyt,
Gen. Thos. H. Hubbard,
John E. Hudson,
Alex. C. Humphreys,
Edward T. Hunt,
Mrs. Robert P. Huntington,
Adolph G. Hupfel,
Frank Hustace,
John S. Huyler,
Clarence M. Hyde,
Frederick E. Hyde, Jr.,
Henry Iden, Jr.,
John B. Ireland,
Adrian Iselin, Jr.,
Miss Georgine Iselin,
Frederic Wendell Jackson,
A. Jacobi,
Robert Jaffray,
A. C. James,
D. Willis James,
Robert C. James, M.D.,
Samuel M. Jarvis,
O. G. Jennings,
Walter Jennings,
James R. Jesup,
Geo. Pryor Johnson,
Adrian H. Joline,
Mrs. John D. Jones,
S. Nicholson Kane,
Mrs. H. F. Kean,
Mrs. A. B. Kellogg,
Mrs. Chas. Kellogg,
Thos. H. Kelly,
Edward Kemp,
Prof. J. F. Kemp,
H. Van Rensselaer Kennedy,
Mrs. Elizabeth C. Kenyon,
Mrs. Catharine L. Kernochan,
John B. Kerr,
George A. Kessler,
Wm. Kevan,
Saml. Keyser,
David H. King, Jr.,
William F. King,
William M. Kingsland,
Gustave E. Kissel,
Herman Knapp,
Shepherd Knapp,
Percival Knauth,
Henry C. F. Koch,
Chas. Kohlman,
Julius G. Kugelman,
Percival Kühne,
H. R. Kunhardt, Jr.,
Adolf Kuttroff,
William M. Laffan,
Francis G. Landon,
Woodbury Langdon,
J. D. Lange,
Jesse Larrabee,
Richard Lathers,
John Burling Lawrence,
Richard H. Lawrence,
Mrs. Samuel Lawrence,
W V. Lawrence,
J. D. Layng,
Emanuel Lehman,
Arthur L. Lesher,
Julius Levine,
Mrs. John V B. Lewis,
Philip Lewisohn,
Wm. S. Livingston,
Wm. C. Lobenstine,
James Loeb,
Prof. Morris Loeb,
Walter S. Logan,
Mrs. Daniel D. Lord,
Franklin B. Lord,
R. P. Lounsbery,
Mrs. Charles Russell Lowell.

Charles H. Ludington,
August Lueder,
Walther Luttgen,
Samuel H. Lyman,
Mrs. Alida McAlan,
C. W. McAlpin,
Geo. L. McAlpin,
John A. McCall,
J. Jennings McComb,
Mrs. W. H. McCord,
John A. McCreery, M.D.,
Thos. A. McIntyre,
Mrs. Jeannie McKewan,
Gilbert H. McKibbin,
Rev. Haslett McKim,
Geo. William McLanahan,
Dr. J. McMahon,
Geo. R. MacDougall,
W. W. MacFarland,
J. W. Mack,
D. E. MacKenzie,
Malcolm MacMartin,
Chas. A. Macy, Jr.,
V. Everit Macy,
J. H. Maghee,
Alexander Maitland,
Chas. Mallory,
Howard Mansfield,
Theophilus Marc,
A. Marcus,
Peter Marié,
Jacob Mark,
T. M. Markoe,
Henry G. Marquand,
Chas. M. Marsh,
Chas. H. Marshall.
Louis Marshall,
W. R. H. Martin,
Brander Matthews,
Robert Maxwell,

David Mayer,
Harry Mayer,
Mrs. Emma Mehler,
Payson Merrill,
Capt. Henry Metcalfe,
J. Meyer,
Thos. C. Meyer,
Dr. Geo. N. Miller,
S. M. Milliken,
W. McMaster Mills,
Peter Moller,
John Monks,
A. C. Monson,
Alphonse Montant,
Francis C. Moore,
Wm. H. Helme Moore,
Mrs. Daniel Moran,
E. D. Morgan,
George H. Morgan,
A. H. Morris,
A. Newbold Morris,
Henry Lewis Morris,
Geo. Austin Morrison
Ed. M. Muller,
Robert I. Murray,
H. O. Moss,
Isaac Myer,
Nathl. Myers,
Adam Neidlinger,
Edward M. Neill,
Wm. Nelson,
Geo. G. Nevers,
Miss Catherine A. Newbold,
Miss Edith Newbold,
Frederic R. Newbold,
Geo. L. Nichols,
John Notman,
Hon. James A. O'Gorman,
E. E. Olcott,
Robert Olyphant,

Mrs. Emerson Opdycke,
Wm. S. Opdyke,
Adolphe Openhym,
Mrs. Wm. Openhym,
William C. Orr,
Prof. Henry F. Osborn,
W. C. Osborn,
Mrs. W. H. Osborn,
Lowell M. Palmer,
N. F. Palmer,
S. S. Palmer,
Henry Parish,
John H. Parker,
Henry V. Parsell,
Mrs. Phebe A. Parshall,
Charles Parsons,
Mrs. Edwin Parsons,
John E. Parsons,
J. M. Patterson,
Alfred Pell,
Miss Frances Pell,
Wm. Hall Penfold,
Geo. H. Penniman,
Samuel T. Peters,
W. R. Peters,
Lloyd Phoenix,
Phillips Phoenix,
Gottfried Piel,
Winslow S. Pierce,
Gifford Pinchot,
James W. Pinchot,
Fred S. Pinkus,
Gilbert M. Plympton,
Henry W. Poor,
C. A. Postley,
De Veaux Powel,
Joseph M. Pray,
J. Dyneley Prince,
Chas. Pryer,
Percy R. Pyne,
Jas. H. Quintard,

Charles Raht,
Geo. Curtis Rand,
Gustav Ramsperger,
Rastus S. Ransom,
Geo. R. Read,
Wm. A. Read,
G. H. Redmond,
Whitelaw Reid,
John B. Reynolds,
Miss Serena Rhinelander,
John Harsen Rhoades,
Chas. Rice, Ph.D.,
Auguste Richard,
P. de P. Ricketts,
Sam'l Riker,
Wm. C. Rives,
S. H. Robbins,
Miss Mary M. Roberts,
Andrew J. Robinson,
Frederick Rode,
J. C. Rodgers,
Edward L. Rogers,
N. C. Rogers,
Noah C. Rogers,
Theo. Rogers,
Leo Rosett,
W. Emlen Roosevelt,
Elihu Root,
Jacob Rothschild,
Wm. Rothschild,
George P. Rowell,
Jacob Ruppert,
Mrs. A. D. Russell,
Chas. Howland Russell,
Clarence Sacket,
Henry W. Sackett,
Mrs. Edward C. Sampson,
L. F. Saumenicht,
Robt. W. Schedler,
Carl Schefer,
Robt. Schell,

J. Egmont Schermerhorn,
Wm. Jay Schieffelin,
Jacob H. Schiff,
Miss Jane E. Schmelzel,
Henry W. Schmidt,
Paul G. Schoeder,
Edward M. Scudder,
C. Schumacher,
B. W. Schwab,
Adolph Schwarzmann,
Wm. F. Sebert,
Mrs. Horace See,
George W. Seligman,
T. G. Sellew,
F. Seringhaus,
Mrs. Angelica B. Shea,
W. H. Sheehy,
Edward M. Shepard,
G. K. Sheridan,
Gardiner Sherman,
G. O. Shields,
Robt. Simon,
Chas. F. Smillie,
James D. Smillie,
Mrs. Annie Morrill Smith,
Edward A. Smith,
George W. Smith,
John Jewell Smith,
James R. Smith,
Walter M. Smith,
Hans Sommerhoff,
Chas. Sooysmith,
A. W. Soper,
Samuel Spencer,
Paul A. Spofford,
Miss Anna Riker Spring,
Dr. Edward Hamilton Squibb,
John Stanton,
J. R. Stanton,
Jno. N. Stearns,
James H. Stebbins,
James R. Steers,
Benjamin Stern,
Isaac Stern,
Louis Stern,
Alexander H. Stevens,
Lispenard Stewart,
Wm. R. Stewart,
Jos. Stickney,
Miss Clara F. Stillman,
James Stokes,
Mrs. J. O. Stone,
Mason A. Stone,
Sumner R. Stone,
Chas. Strauss,
Edward Sturges,
F. K. Sturgis,
Thos. Sturgis,
Mrs. Geo. Such,
John S. Sutphen,
Frederick G. Swan,
Albert Tag,
Edward N. Tailer,
C. A. Tatum,
Miss Alexandrina Taylor,
Stevenson Taylor,
Wm. E. Tefft,
C. H. Tenney,
H. L. Terrell,
John T. Terry,
Ernest Thalmann,
Anthony J. Thomas,
Samuel Thomas,
Robert M. Thompson,
Walter Thompson,
W. Gilman Thompson, M.D.
Miss Phebe Anna Thorne,
William Thorne,
W. V. S. Thorne,
C. L. Tiffany,
Louis C. Tiffany,
Albert Tilt,

E. Titus, Jr.,
J. Kennedy Tod,
William Toel,
Wm. Toothe,
Henry R. Towne,
R. H. L. Townsend,
R. W. Townsend,
C. D. Tows,
J. Evarts Tracy,
Edwin D. Trowbridge,
Alfred Tuckerman,
Mrs. L. Tuckerman,
Paul Tuckerman,
Edward P. Tysen,
E. S. Ullmann,
Miss Anna Murray Vail,
Herbert Valentine,
Mrs. Lawson Valentine,
Cornelius Van Brunt,
Chas. H. Van Brunt,
E. H. Van Ingen,
Alfred Van Santvoord,
Edgar B. Van Winkle,
Miss Elizabeth S. Van Winkle,
Geo. H. Vose,
John Wagner,
Hon. Salem H. Wales,
Henry F. Walker,
Antony Wallach,
Wm. I. Walter,
E. A. Walton,
Wm. T. Wardwell,
Allan C. Washington,
Miss Emily A. Watson,
H. Walter Webb,
S. D. Webb,
W. H. Webb,
Mrs. John A. Weekes,
Chas. Wehrhane,
Camille Weidenfeld,
R. E. Westcott,
Geo. Westinghouse,
Jno. M. E. Wetmore, M.D.
Geo. G. Wheelock, M.D.,
Dr. Wm. E. Wheelock,
Horace White,
Stanford White,
J. Henry Whitehouse,
Worthington Whitehouse,
Wm. Wicke,
Edward A. Wickes,
Franklin A. Wilcox,
Robt. F. Wilkinson,
David Willcox,
Jno. T. Willets,
Robt. R. Willets,
G. G. Williams,
Richard H. Williams,
Mrs. Douw D. Williamson,
Washington Wilson,
Wm. G. Wilson,
Egerton Winthrop,
Grenville L. Winthrop,
Mrs. Frank S. Witherbee,
Ernest G. W. Woerz,
A. Wolff,
Emil Wolff,
Lewis S. Wolff,
Mrs. Cynthia A. Wood,
John D. Wood,
William Congdon Wood,
John A. Woods,
F. F. Woodward,
R. S. Woodward,
Miss Cornelia S. Wray,
W. H. Woolverton,
Henry H. Wotherspoon,
C. S. Young,
Edw. L. Young,
Andrew C. Zabriskie,
O. F. Zollikoffer,

REPORT OF THE TREASURER.

(*Submitted and Accepted January 8, 1900.*)

To the Board of Managers of the New York Botanical Garden.

Gentlemen:

Following is a statement of my Receipts and Disbursments during the calendar year 1899, and a Balance Sheet as of December 30, 1899.

Receipts.

Balance on hand January 2, 1899.....		$107,145.32
Contributions to Endowment Fund.....		5,000.00
Fellowship Fees.....		2,000.00
Life Membership Fees.....		6,700.00
Students' Research Fund, from Fees.....		180.50
City Maintenance, 10 months, January to October, inclusive.....		25,368.12
Income from Investments, ...		6,329.12
Annual Dues.....		7,220.00
Interest on Deposits.....		2,159.84
Prizes.....	$ 5.00	
Merchandise Sold.....	31.75	
Publications Sold.....	14.65	51.40
Final Contribution of C. Vanderbilt to Puerto Rico Exploration Fund.....		750.00
Contributions to Special Book Fund.....		4,950.00
Proceeds $43,000 New York City Bonds @ 101.....		43,376.25
		$211,230.55

Disbursements.

Paid for $50,000, Ches. & Ohio Genl. Mtge. 4½% Bonds @ 97½ less accrued interest charged to income account.....		$47,875.00
for $50,000 Southern Ry. 5% Bonds @ 109½ less accrued interest.....		54,604.17
for $50,000 Erie Ry. Prior Lien 4's @ 92½ less accrued interest.....		46,145.84

Paid Director in Chief for Working Fund	5,000.00	
" " account City Maintenance..	25,368.12	
" " for Vouchers Paid.....	14,223.12	
Paid R. W. Gibson for Plans.....	750.00	
Paid account Puerto Rico Exploration...	1,284.00	
Paid for Books for Library, account Special Book Fund.....	1,880.75	197,131.00
Balance on Hand,.....		$14,099.55

BALANCE SHEET, DECEMBER 30, 1899.

Dr.

Investments. Net cost of $110,000 New York City 3% Bonds.....$109,623.75		
$50,000 Erie Railroad Prior Lien 4% Bonds.....	46,145.84	
$50,000 Chesapeake & Ohio General Mortgage 4½ % Bonds.....	47,875.00	
$50,000 Southern Railway 5% Bonds.....	54,604.17	$258,248.76
Construction, paid for plans not yet used..		2,350.00
Income account (borrowed form Permanent Funds).....		4,141.44
Director in Chief, Working Fund.....		5,000.00
Cash.....		14,099.55
		$283,839.75

Cr.

Endowment Fund.....$264,750.00		
Fellowship fees.....	8,000.00	
Life membership fees.....	6,900.00	
Students' fees.....	180.50	
Total, permanent funds.....		$279,830.50
Balance Special Book Fund for Library		3,069.25
Balance Fund for Ellis collection.....		940.00
		$283,839.75

C. F. COX, *Treasurer.*

REPORT OF THE SCIENTIFIC DIRECTORS.

(*Submitted and accepted January 8, 1900.*)

TO THE BOARD OF MANAGERS.

Gentlemen: I have the honor to submit herewith the report of the Board of Scientific Directors for the year now closing.

The Scientific Directors have held four meetings. At the meeting of April 28, 1899, a very important step was taken in approving an outline of research courses to be offered by the officers of the New York Botanical Garden, and of Columbia University. This step established the educational work of the Garden upon a systematic basis and defined its standards. Advanced courses in almost all departments of Botany were authorized and their acceptability for advanced degrees in Columbia University was specifically stated. The fees for instruction were decided upon, and methods were approved whereby students unable to pay the fees might discharge their obligations in part by services rendered the Garden. The Scientific Directors also accepted an offer of twenty-five microscopes from Mr. William E. Dodge. The appointment of the Director-in-Chief, which had previously been for a term of three years, was made permanent.

At the meeting of September 26th, a detailed report was submitted by the Director-in-Chief, setting forth the needs of the laboratories in the new Museum Building. The details of the estimates were carefully gone into by the Directors, and it was voted to recommend to the Board that $1,000 be appropriated for this purpose. Most gratifying progress was also mentioned by the Director-in-Chief, in the installation of the Museum, labelling of outdoor collections, researches by members of the staff, and accessions of books and botanical material. The proposition to establish a monthly journal, under the auspices of the Garden was approved, and at the meeting of December 11th, was finally formulated for submission to your Honorable Body.

At the meeting of December 11th, certain changes in the staff of instructors necessitated by the illness of Dr. H. M.

Richards were approved, and certain important rules were adopted for the government of the officers of the Garden. The general principle embodied in these rules is that the time of the officer belongs to the Garden, and that no outside work should be done without the written permission of the Director-in-Chief, and also that all writings of salaried officers of the Garden, intended for publication, should be approved by the Director-in-Chief before being printed. The final agreement between the Botanical Garden and Columbia University regarding certain periodicals taken by the latter and deposited with the Garden, was ratified, and the purchase of meteorological apparatus for the recording of data at the Garden, beginning with January 1, 1900, was approved. Rules were adopted regarding the loaning of specimens and books from the collections or Library of the Garden, which are necessary to prevent the loss of valuable material. Steps were also taken to bring before your Honorable Body, the desirability of purchasing an additional collection from Mr. J. B. Ellis, of Newfield, N. J., which action has been duly reported in the regular routine. Important plans were approved for the primary installation of the living plant collections in the great conservatory of the Garden during the year 1900. The necessity of making a proper display in the horticultural-houses which are now approaching completion, has been deeply felt by the Board of Scientific Directors, and it is their ambition to carry out the scheme in a way that will seem worthy of the enterprise and of the city.

From these general statements, it will be seen that although the Museum has not been completed for occupancy, yet the work of instruction of the Garden has already been begun. The Museum is so nearly finished, however, that all the preliminaries have been arranged to enable the Garden to enter upon one of the chief fields of its activity. It is doubtful whether any more important year in the history of the Garden will be passed than the one now closing.

Very respectfully yours,

SETH LOW,
Chairman.

AN OUTLINE OF RESEARCH SUBJECTS OFFERED BY THE SCIENTIFIC STAFF OF THE NEW YORK BOTANICAL GARDEN AND OF THE DEPARTMENT OF BOTANY OF COLUMBIA UNIVERSITY.

Physiology of the Cell. Problems in the chemical and the physical properties, movements and irritability of unicellular and other generalized organisms. Laboratory. Doctor MacDougal.

Ecology. Plants studied in relation to their environment and the problems of evolution involved. Field and laboratory; conferences. Professor Lloyd.

Morphology of Algae. Study of the structure and development of the Algae. Field and laboratory. Doctor Howe.

Morphology of Fungi. Study of the structure, polymorphism and development of the Fungi, including culture methods. Field and laboratory. Professor Underwood.

Morphology of Bryophyta. Study of the structure and development of Musci and Hepaticae. Field and laboratory. Professor Underwood; Mrs. Britton.

Morphology of Pteridophyta. Study of the structure and development of Ferns and Fern-allies. Field and laboratory. Professor Underwood.

Morphology of Spermatophyta. Study of the structure and development of the Flowering Plants. Field and laboratory. Doctor Rydberg.

Experimental Morphology. A study of variation of form and structure, and determination of the causes. Professor Lloyd.

Taxonomy of Algae. Study of the diagnostic characters and relationships of the principal families and genera. Field, herbarium and laboratory work. Doctor Howe.

Taxonomy of Fungi. Study of the diagnostic characters and relationships of the principal families and genera. Field, herbarium and laboratory work. Professor Underwood.

Taxonomy of Bryophyta. Study of the diagnostic characters and relationships of the principal families and genera.

Field, herbarium and laboratory. Professor Underwood; Mrs. Britton.

Taxonomy of Pteridophyta. Study of the diagnostic characters and relationships of the principal families and genera. Field, herbarium and laboratory. Professor Underwood.

Taxonomy of Spermatophyta. Study of the principal families and genera. Field, herbarium and laboratory. Doctor Britton, Doctor Small, Doctor Rydberg.

Taxonomy of Gramineae. Study of the diagnostic characters and relationships of the principal genera. Field, herbarium and laboratory. Mr. Nash.

Embryology of Spermatophyta. Comparative embryology of special groups. Special embryological problems. Technique. Professor Lloyd.

Special Taxonomy. Critical study of a family or genus of plants of not less than fifty species. The group may be chosen from the entire range of the vegetable world. Field, herbarium, laboratory and garden. Directed, according to the group chosen, by Professor Underwood, Doctor Howe, Doctor Britton, Doctor Small, Doctor Rydberg, Mr. Nash, Professor Burgess, Mrs. Britton.

Regional Botany. Collection, determination and comparative study of the plants of some restricted area. Field, herbarium and laboratory. Professor Underwood, Doctor Britton.

Physiology of Nutrition. Treated from a chemical stand point. Doctor MacDougal.

Ecological Physiology. Problems in adaptive reactions, in form, structure and movements to external energy and environmental factors. Field and laboratory. Doctor MacDougal; Doctor Curtis; Professor Lloyd.

Physiological Anatomy. Problems in the relationships of tissues and functions. Laboratory. Doctor Curtis.

General Physiology. Problems in absorption, excretion, nutrition and transformations of energy, growth, the general irritable organization of the plant and mechanism of movement. Laboratory. Doctor MacDougal; Doctor Curtis.

REGULATIONS FOR THE ADMISSION AND REGISTRATION OF STUDENTS.

A. Students registering at the Garden for the use of its Laboratories or Herbarium under the direction of any officer of instruction must satisfy the Director-in-Chief that they are competent to pursue studies which they desire to prosecute; they will be required to pay a fee of fifteen dollars per hour, per week, per year up to ten hours per week, per year ($150.00), beyond which no charge will be made. The student "year" will be taken at thirty-six weeks, and courses will ordinarily commence the first week in October.

B. Students who may present statements satisfactory to the Director-in-Chief that they are unable to pay the required fees, may be permitted to do work on the collections, under the direction of the Curator of the Museums or of the Head Gardener, at an allowance of twenty-five cents per hour, or as an equivalent to the full fee of one hundred and fifty dollars, six hundred hours of such work; or they may supply specimens, plants or books desired for the collections in value equal to the amount of the fees, such valuation to be determined by the Director-in-Chief.

BOTANICAL CONTRIBUTIONS.

The Roots and Mycorhizas of some of the Monotropaceae.

By D. T. MacDougal and Francis E. Lloyd.

(With Plates 10, 11 and 12.)

The members of the family Monotropaceae are chlorophyll-less without exception and have the roots sheathed with a heavy mycelial layer of an ectotropic fungus. The symbiosis between the fungus and the higher plant is complete, and this family exhibits the most marked adaptations to the mycorhizal habit of any of the seed-plants, and in them we may observe the extreme development of a physiological tendency which has recently been found to be so widespread. The adaptation in question appears to be of very ancient origin in this family and has been followed by very sweeping degenerations of the roots and shoots. Both members have been reduced to such an extent that it would not be possible for any species of this family to endure an extended period in the absence of the fungal symbiont.

It is of interest to note that in *Monotropa* is found the first known example of a mycorhiza, or adhesion of a fungus to the roots of a higher plant. This discovery dates back to 1832 when E. Fries wrote of the "fungus roots" of *Monotropa*, which were clothed with a *Tuburcinia* (2). Since that time a score of investigators have touched upon various features of the morphology and physiology of *Monotropa uniflora* and *M. Hypopitys*. So far as the examination of the mycorhiza has been made attention has been paid chiefly to *M. Hypopitys* which is now placed in a separate genus. The development and mycorhizal adaptations of *Sarcodes* were described by Oliver in 1890 (6). *Sarcodes*, *Schweinitzia*, *Monotropa*, *Hypopitys*, and *Pterospora* were treated as parasites by Chatin (1) in disregard of the accumulated evidence bearing upon the true nature of the group. Singularly enough this author does not hesitate to discuss the

physiology of the entire group although the mycorhizas, and the roots as well, of many of them were not observed. *Pterospora* was examined by MacDougal anatomically and observations of its habits were made in the field during one season (5).

A review of the various papers bearing upon the subject shows so many discrepancies of statement that it was deemed advisable to re-examine material of *Pterospora*, *Sarcodes*, *Hypopitys* and *Monotropa*, with a view to the determination of the comparative degeneration of the roots and the anatomical relations of the two symbionts. The material of *Sarcodes* was furnished by Dr. G. F. Peirce of Stanford University, and includes young specimens taken at the beginning of the formation of the shoot, which do not show all the characters of *Sarcodes sanguinea* Torr., and possibly represent a new variety or an undescribed species of this genus. This may account in part for the disagreement of our results from those of Oliver (6).

The shoots in this family are of course purely reproductive in their purpose, since all of the energy of the plant in the form of organic substances is taken in through the roots by the coöperation of the sheathing fungus. As a consequence the ordinary relations of size and extension of the root and shoot systems disappear.

Sarcodes exhibits a stem which may reach 35 cm. in height and 2 to 5 cm. in thickness, bearing numbers of fleshy scales and bracts liberally supplied with stalked glands. The root system is densely branched and the total bulk is greatly in excess of that of the aërial shoot, and also exceeds the bulk of the soil in the space occupied.

Pterospora sends up a cylindrical stalk furnished with bracts and numerous glands reaching a height of 50 to 150 cm. and a diameter of .5 to 1.1 cm. The root system is a small compact mass not more than two or three times the bulk of the basal section of the stem, and is totally inadequate to the mechanical fixation and support of the heavy aërial stalk. This stalk is, most anomalously, supplied with stomata.

Monotropa and *Hypopitys* exhibit a heavy development of

underground roots, which exceed the reproductive stems in both bulk and weight and also completely fill the space they occupy almost to the exclusion of the humus soil in which they grow.

These great variations in the comparative size of the root and shoot may be reconciled only in the light of the fact that the real absorbing organs are the branching strands and hyphae, which radiate from the sheathing mycelium, and that the size of the root system is one adapted to furnishing a suitable habitat to the ectotropic fungus and for the storage of surplus material. It is impossible to account for the preservation of the large shoot with stomata in *Pterospora* with the data now at hand.

It is important to call attention to the fact that the vegetative period of the association, during which time food and therefore energy are being acquired, by no means coincides with the existence of the aërial shoot. The fungus coating the roots may carry on absorption during the entire season when the temperature is above the freezing point, and the accumulated store is drawn upon by the higher plant for the formation of shoots only in late summer. Growth and the formation of buds on the roots may proceed underground coincident with the entire season of absorption of food.

According to most of the writers who have touched upon this point, the roots of adult plants are adventitious and give rise to buds, which arise endogenously after the manner of the nearly related Pyrolaceae. This fact is confirmed by the evidence obtained from the genera under discussion. Main or primary roots would therefore be found on seedlings only. Members of this family have also lost the power of branching of the shoot, except so far as giving off the simple peduncles is concerned. The roots show branches of the second and third order in all the genera examined. The branches are arranged in five orthostichies in *Sarcodes* according to Oliver, in three or four in *Hypopitys* according to Kamienski, but no orthostichous condition may be recognized in *Pterospora* or *Monotropa*, although Oliver credits the former with three

or four rows of branches. A series of transverse sections of the apical portion of a root of *Monotropa* 2 mm. in length showed five branches separated from each other by very unequal angles (Plate 10, Fig. 3); a condition to be expected in such a degenerate stele and with the roots arising in the outer cortex.

The secondary roots of *Sarcodes* are said by Oliver to arise exogenously, and a similar condition has been found by one of the authors in *Pterospora* (5). In *Hypopitys* the branches arise endogenously. *Monotropa* presents a most interesting peculiarity in this regard. The initial cells of the new root arise in the third layer of the cortex (Plate 10, Figs. 2 and 4). As the embryonic tissue of the new root develops, the pressure set up crushes the epidermal cells of the main root first, then later the intervening cortical cells. This behavior is due to the fact that the entire root is firmly encased in the heavy sheathing mycelium, which possesses great tensile strength. This mycelial mantle is extended to cover the growth of the new rootlet. During the process of emergence the outer layer of the new root cap of the rootlet is also crushed (Plate 10, Fig. 2).

The root-cap is but little developed in *Hypopitys* and *Monotropa* consisting of one to four layers, but it shows many layers in *Sarcodes* and *Pterospora*. In all cases the cap arises from a calyptrogenic layer in common with the epidermis by tangential division (Plate 11, Fig. 10). The outer cells of the cap soon become compressed and crushed by the mycelial mantle which completely encloses the tips in all members of the family we have examined. *Monotropa* and *Hypopitys* are reported by Oliver to exhibit a root apex free from the fungus; a statement that can only be accounted for by the supposition that this conclusion may have been based upon young adventitious roots which had not yet been completely invested by the fungus. It is possible, of course, that a root might outstrip the mantle during a period of rapid growth and become enmeshed later.

The initial cells of the periblem and plerome lie immedi-

ately behind the calyptrogen and may not be distinguished in *Monotropa* except by their position, and these regions in *Hypopitys* as well, do not become differentiated until some distance back from the tip (Plate 11, Fig. 10). The pressure of the mycelial mantle and the crushing of the outer cells of the root cap gives rise to displacements of the initial elements in a radial direction.

The stele is much reduced in all members of the family. Oliver notes that five xylem bundles are to be seen in *Sarcodes*, although our material showed six; three or four appear in *Hypopitys* according to Kamienski, but no exact statement may be made as to *Monotropa*. *Pterospora* and *Sarcodes* exhibit five or six bundles of protoxylem surrounding a central medulla. That of *Sarcodes* shows spiral vessels and scalariform ducts, but *Pterospora* has but three or four scaliform vessels in each bundle. Kamienski notes the presence of vessels half way between spiral and the annular form in *Hypopitys*, as well as sieve tubes, bast and wood cells. The phloem in all of the species appears to consist chiefly of elongated elements much like companion cells. The central cylinder of *Monotropa* shows the greatest reduction of any seed plant which has yet been noticed. The xylem bundles at no time are distinct, but their remnants are crowded to the center and make a cluster of four or five scalariform vessels, five or six times as long as broad with oval perforations, obliquely placed (Plate 11, Fig. 5 and 7). The ends do not open into each other. Surrounding these vessels is an irregular circle of elements of slightly smaller dimensions and heavy proteinaceous content (Plate 11, Fig. 5). No endodermis may be made out. The cortex consists of seven to ten layers of globular or cylindrical cells, which sometimes show much starch especially near the tips of the root.

The epidermis is composed of columnar cells in *Sarcodes* and ovoid elements in the other genera. These cells are in contact with each other near the apex of the root but soon become separated by the hyphae which push in between, making a pseudo-parenchyma (Plate 12, Fig. 15). The

mycelium or heavy layer of the fungus is composed of brownish septate hyphae which is much thicker in *Sarcodes* than in any of the other species. The mycelium is distinctly marked into two regions in all forms except *Pterospora*. The outer region is composed of a looser mesh of strands, which separate into single hyphae which pass out into the soil and perhaps penetrate to long distances, constituting the absorbing organs of the association. The inner layer of the mycelium is generally composed of hyphae which run at right angles to the axis of the root. The internal branches which penetrate between the cells send off hyphae which gain entrance to the epidermal cells in all of the species examined, filling them up with meshes of threads in *Pterospora* and *Sarcodes* and giving rise to various enlargements in *Monotropa* and *Hypopitys*.

In the former simple branching results, but in the latter the hyphae expand to form vesicles, "sporangioids, and "sporangioles" which more or less completely fill the cells. These swollen protuberances are perhaps atrophied reproductive branches, and they probably serve as organs of interchange between the fungus and the seed plant (Plate 12, Figs. 12–20). The entrance of a fungus into the epidermal cell is first made at the limits of the root cap. The enlargement of a hypha to form a vesicle results in a globular body which is filled with fine and then coarsely granular contents. Later the vesicles become blackish or brownish. The nucleus of the invaded cell is usually pushed toward the outer or distal end of the cell, and does not become hyperchromatic. It disintegrates however, before exfoliation sets in. Protuberances which might be regarded as rudimentary root-hairs were seen by Kamienski but none have come under our notice. In certain instances cells invaded by the fungus are seen to contain numbers of globular bodies of a diameter of .0032 mm. which exhibit a distinct spore appearance (Plate 12, Fig. 17). The appearance of some of the sporangioids suggests that they may be altered conidial branches and that these bodies are the result of the more perfect development of some of them.

The fungus is thus seen to bear the same general relation to the higher plant as that observed by one of the authors in numbers of mycorhizal species. The vegetative part of the fungus coats the surface of the root sending out branches into the substratum, and organs of interchange into the epidermal cells of the higher plant. In *Corallorhiza* and allied forms the mycelium or vegetative part of the fungus lives in the outer cortical layers, sending out the two kinds of branches. In the closely related family of the Pyrolaceae the epidermal cells are enlarged to such an extent that they occupy half the radius of the root and serve to shelter the mycelium of the symbiotic fungus, and its organs of interchange.

It is noteworthy that *Monotropa* has been under investigation for sixty years and that the identity of the symbiotic fungus is still unknown, or not clearly established. Fries named it *Tuburcinia Monotropae*, on an external examination but he did not place it with the species of the genus which have since been included in the Ustilaginae, and he thought later that it resembled the conidial forms of *Sepedonium*, *Fusidium*, or *Zygodesmus* (2, 3). Ryland described the manner of the occurrence of the "byssoid fungus" on the roots of *Monotropa*, and M. J. Berkeley recognized *Epiphagos Luxfordii*, *Zygodesmus Berkelyi*, and *Sepedonium Wilsoni*, *Cladosporium Leesi* in the layer sheathing the roots (7). The authors have found a perithecium resembling that of the Pleosporiaceae in the meshes of the fungus of *Hypopitys*, and MacDougal detected conidial branches like those of *Penicillium* on *Pterospora*. A series of careful cultures would be necessary to establish the identity of the fungus in each instance as well as in all symbiotic associations of this character. It is not improbable that different species will be found to adhere to the forms under discussion in different localities.

The changes ensuing in these roots with age, are of the greatest interest. An exfoliation of the epidermis carrying with it the mycelial layer is very marked in *Sarcodes* and *Pterospora*, and is sometimes seen in *Hypopitys* and *Mono-*

tropa. This is connected with the fact that the roots of the first two increase in size to two or three times their original diameter, while the roots of the last two undergo but little alteration in dimension. The growth of *Hypopitys* and *Monotropa* is due to the activity of the cortex. In *Pterospora* and *Sarcodes* the cortex is active, and after exfoliation the sub-epidermal cells undergo division in the planes of the radii, and growth takes place at other places in the cortex.

The central cylinder of *Sarcodes* and *Pterospora* is least reduced and its development may be traced in them with some certainty. Here the five or six xylem bundles alternate with the simple phloem enclosing a well marked medulla. The first step in the secondary growth is the sclerotization of the medulla, and is followed by the lignification of this tissue in *Sarcodes*. Next the phloem gives rise to a cambium which develops wood internally, and bast on the outside. The latter consists for the greater part of elongated elements of narrow lumen which do not undergo any marked thickening of the walls. The wood formed by the cambium joins directly on to the lignified medulla. The inner ends of the primary medullary rays also undergoes sclerotization to some extent, but the outer portions show as broad bands one or two layers in thickness with the characteristic appearance of being compressed tangentially. The advance of the cambium is at first fairly regular, as the cambium zone moves outwardly beyond the first ring formed the transformation into vessels is accomplished with such disturbance or variance from the customary manner that it is not possible to draw a line separating the two regions. Furthermore some of the cambium cells of great size remain as great thin-walled elements in the wood, or these may be arranged in radial lines simulating tertiary rays (Plate 12, Fig. 11). A region of cambiform elements four to six layers in thickness may be seen entirely surrounding the xylem. The structure formed by this behavior of the cambium resembles that of a stem, and indicates that the roots of the two genera in question may attain an age of two years or more.

The secondary formations in *Monotropa* and *Hypopitys* are very feeble (Plate 11, Figs. 6 and 7). The irregular zone of phloem surrounding the central cluster of vessels forms a few similar vessels from the elements in contact with the xylem (Plate 11, Fig. 6), but the remainder of the phloem undergoes no noticeable change. In *Pterospora* there is a band of cells lying in the inner edge of the cortex, which may be of the cortex, or the stele, and which undergo thickening and pitting (Plate 11, Figs. 8 and 9), and function as mechanical bast: correlated with the extraordinary development of stem.

The following statements may be made in summary of the foregoing:

A complete symbiosis of very ancient origin exists between the Monotropaceae and the ectotropic fungi of the roots, and this association has been followed by very sweeping degenerations in the higher plant. The fungus sheathing the roots of *Monotropa*, has been variously determined as a *Tubercinia*, *Sepedonium*, *Zygodesmus*, *Fusidium*, *Epiphagos* and *Cladosporium*, and that the authors found a perithecium of one of the *Pleosporiaceae* on the roots of *Hypopitys*.

The fungus generally sheathes the entire root, entering the epidermal cells in all of the four genera discussed, forming masses of hyphae in the cells of *Sarcodes* and *Pterospora*, and vesicles and other enlargements in *Monotropa* and *Hypopitys*.

The members of the family examined have lost the power of branching of the shoots, which are purely reproductive in their purpose. Vegetive propagation is secured by buds of endogenous origin on the roots. Secondary roots arise exogenously in *Sarcodes* and *Pterospora*, endogenously in *Hypopitys* and from the third cortical layer of the cortex in *Monotropa*.

The root cap is least developed in *Monotropa* and *Hypopitys* and most in *Sarcodes*. The histogenic layers are not distinguishable. The stele is much reduced. Five or six bundles may be recognized in *Sarcodes* and *Pterospora*, three or four in *Hypopitys*, but no distinction of this kind may be

made in *Monotropa*. Spiral vessels appear in the protoxylem of *Sarcodes*. Closed scalariform vessels only in the other genera. A medulla is present in *Sarcodes* and *Pterospora*, and secondary thickening occurs in these two genera, which gives the roots a stem-like appearance. The roots of these two plants probably live two or more years while the others are annuals. The roots are to be considered as the main axis in the Monotropaceae, since they serve to reproduce the plant, as organs of storage, and as a habitat for the symbiotic fungus, which is the absorbing member in the association.

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Explanation of Plates.

All figures are of *Monotropa uniflora*, unless otherwise stated.

Plate 10.

Fig. 1. Section of mass of roots at base of stem.

Figs. 2 and 4. Origin of secondary roots. Fig. 4 shows the initial cells arising in the third cortical layer of the main root. Fig. 2 illustrates an advanced stage of development of the new apex. The young root has pushed beyond the general outline of the main root, and the outer cells of the root-cap have collapsed.

Fig. 3. Diagram of a transverse section taken near the apex of a root showing three secondary roots in the plane of the section and two others immediately below.

Plate 11.

Fig. 5. Longitudinal section of the stele showing the vessels and one layer of phloem cells.

Fig. 6. Transverse section of the stele showing eight scalariform vessels surrounded by the undifferentiated phloem. Taken from an old root.

Fig. 7. Transverse section through the stele of a young root. The formation of vessels has included but five cells. The additional vessels shown in Fig 6 have been formed directly from the reduced phloem.

Fig. 8. *Pterospora Andromedea*. A tangential section passing through the outer portion of the phloem in an old thickened root. Of the cortical cells on the right two have undergone pitting and thickening, while the other two retain their protoplasmic content. On the left are to be seen the cells of the outer phloem, with some of the large cells of the medullary rays.

Fig. 9. *Pterospora Andromedea*. A sclerotized cortical cell cut transversely, showing the pitted end walls.

Fig. 10. Root tip cut longitudinally, showing cap and initial cells. The mycelial mantle is seen to be continuous over the entire extremity of the root.

Plate 12.

Fig. 11. *Sarcodes sanguinea*. Section of outer portion of stele in which secondary thickening has begun. The irregular cambium layer is shown.

Fig. 12. Epidermis 3–4 mm from the apex of the root. The disorganization of the nuclei has begun.

Fig. 13. Same as 12 but nearer the apex with normal nuclei.

Fig. 14. Epidermal cell containing hyphae with branches of grape-like clusters or "sporangioids."

Fig. 15. Epidermal cells in tangential section with separating hyphae showing a parenchymatous formation.

Fig. 16. Perithecium found in the mycelium attached to *Hypopitys*.

Fig. 17. An epidermal cell containing spore-like bodies, and portions of hyphae.

Fig. 18. Other hyphal formations in epidermal cells.

Fig. 19. Epidermal cell with entering hyphae.

Fig. 20. An epidermal cell lined with the wall of a large fungal vesicle, which is partly crumpled.

Some new Grasses from the Southern States.

By Geo. V. Nash.

Erianthus Smallii.

A tall densely tufted perennial. Culms 1.5–2.5 m. tall, the nodes pubescent with long appressed readily deciduous hairs, the summit of the culm and the axis of the panicle copiously

appressed-pubescent with long silky hairs; sheaths usually sparingly hirsute at the apex, otherwise glabrous; ligule scarious, about 2 mm. long, ciliolate at the apex; blades 1.5–7 dm. long, 6–20 mm. wide, rough on both surfaces; panicle 2–4 dm. long, 4–6 cm. wide, its branches erect, the larger 7–10 cm. long, spikelets crowded, about equalling the basal hairs and one-half again as long as the internodes, the outer scales 8–9 mm. long, pilose with long hairs, the fourth scale 2-toothed at the apex, the teeth long and subulate, the awn between them 2–2.5 cm. long, the included portion long and tightly spiral, the remainder loosely spiral.

In low grounds, Tennessee to Florida, west to Mississippi. Type collected by Dr. J. K. Small, to whom I take pleasure in dedicating it, on Stone Mt., De Kalb Co., Ga., Sept. 6–12, 1894. The following specimens are also referred here:

Tennessee: Banks of Hiawassee River, McFarland, *A. Ruth*, Aug. 1894, distributed as *E. brevibarbis*.

Georgia: Yellow River, near McGuire's Mill, Gwinnett Co., *John K. Small*, July 20, 1893.

Florida: *Chapman*.

Alabama: Montgomery, *G. McCarthy*, Aug. 1888, distributed as *E. alopecuroides*.

Mississippi: Starkville, *S. M. Tracy*, Oct. 16, 1895, distributed as *E. strictus*.

Related to *E. contortus*, Ell., but from that species it is clearly distinct. In *E. contortus* the summit of the culm and the panicle axis are glabrous or but slightly pubescent, and the spikelets are considerably smaller.

Manisuris tuberculosa.

A glabrous tufted perennial. Culms somewhat compressed, 8–12 dm. tall, stout, branched for about the upper two-thirds, the branches erect; sheaths broad, much compressed, keeled, striate; ligule scarious, about 1 mm. long; blades erect, 3 dm. or less long, 3–7 mm. wide; spikes finally exserted, 6–10 cm. long, straight, the rachis barely if at all constricted at the nodes; sessile spikelets about 4 mm. long, about equaling the internodes, the first scale with very short transverse wrinkles, or very rarely without wrinkles, the wrinkles tubercle-like, irregularly disposed; pedicellate spikelets reduced to 1

or 2 short scales, about one-half the length of the linear pedicel which is a little shorter than the sessile spikelet and curved around its margin.

Along lake shores, peninsular Florida. Type collected by the writer at Eustis, Lake Co., June 16–30, 1894, no. 1074. Mr. W. T. Swingle also secured it eight mile east of Altoona, in the same county, in 1892. The short tubercle-like ridges at once distinguish this from any form of *M. rugosa*.

ANDROPOGON CAMPYLORACHEUS; *A. Elliottii laxiflorus* Scribn. Bull. Torr. Bot. Club, **23**: 146. 1896. Not *A. laxiflorus* Steud. 1855.

A densely tufted perennial, the innovations with long narrow leaf-blades. Culms 3–8 dm. tall, usually clothed with the overlapping sheaths, finally with several large imbricated sheaths at the summit; upper nodes generally densely barbed with ascending hairs; culm-leaves 4 or 5; sheaths of the innovations densely appressed-hirsute with long hairs, those of the culm glabrous or nearly so; ligule a ring of hairs 1–2 mm. long; lower culm-blades about 1 dm. long, those on the innovations much longer, 1–2 mm. wide, usually folded when dry; racemes usually in pairs, sometimes in 3's, lax, flexuous, finally exserted, 5–10 cm. long, the slender internodes of the rachis usually much exceeding the sessile spikelets, often twice as long; sessile spikelets about 5 mm. long, narrow, acuminate, the first scale folded near the margins, nerved at the folds, the nerves hispid above the middle, the fourth scale bearing a somewhat twisted more or less slightly contorted awn 1.5–2 cm. long.

In dry sandy soil, Florida to Mississippi. Type collected by the writer at Eustis, Lake Co., Florida, Aug. 1–15, 1894, no. 1738; nos. 1597, 1601, 1739 and 1740, of the same collection, are also referred here. Professor S. M. Tracy secured the same thing at Biloxi, Miss., Sept. 15, 1893, no. 2262. At once distinguished from *A. Elliottii* by its long slender flexuous racemes with their much longer internodes.

ANDROPOGON CAPILLIPES; *A. Virginicus glaucus* Hack. in D. C. Mon. Phan. **6**: 411. 1889. Not *A. glaucus* Retz. 1789.

A glabrous glaucous perennial. Culms 1–1.5 m. tall, branched above the middle, these branches again divided and

redivided, the ultimate divisions filiform and considerably exserted, frequently recurved; sheaths much shorter than the internodes, usually about one-half as long, keeled, at least above the middle; ligule scarious, about 0.5 mm. long; blades erect, flat, folded when dry, minutely pubescent on the upper surface, linear, 1–2 dm. long, about 2 mm. wide; inflorescence narrow, 4–6 dm. long, its primary branches erect, the ultimate divisions sometimes spreading, the sheaths from which arise the ultimate divisions narrow and tightly embracing them, the spathes 2–3 cm. long, acuminate; racemes in pairs, 1.5–2 cm. long, exceeded by the spathes; sessile spikelets 3–3.5 mm. long, about twice as long as the internodes, the awn straight, 11–13 mm. long; pedicellate spikelet wanting, or present as a minute rudimentary scale, the pedicel as long as or a little exceeding the sessile spikelet.

In dry soil, North Carolina to Florida. Type collected by Mr. A. H. Curtiss in Florida. This seems to be abundantly distinct from *A. Virginicus*, to which it is related, in the glaucous hue of the whole plant, the glabrous sheaths and especially in the sheaths of the inflorescence, from which arise the peduncles bearing the spathes, which are very narrow and tightly enclose the peduncles, making the contrast between the spathes and the sheaths very marked.

ANDROPOGON SCRIBNERIANUS; *A. Elliottii glaucescens* Scribn. Bull. Torr. Bot. Club, 23: 145. 1896. Not *A. glaucescens* H. B. K. 1815.

A glabrous, usually glaucous, tufted perennial. Culms 5–10 dm. tall, branched above the middle; leaves below the inflorescence 3 or 4; sheaths shorter than the internodes, the basal ones equitant; ligule scarious, about 0.8 mm. broad; blades linear, flat, folded when dry, minutely pubescent above, and usually with some long hairs on the upper surface near the base, the lower culm-blades 1–1.5 dm. long, 2–4 mm. wide, the basal blades often much longer: racemes in pairs, exserted, rather stout, 4–7 cm. long, silvery white; sessile spikelets about twice as long as the internodes, about 5 mm. long, the first scale thick and firm, folded near the margins, strongly nerved at the folds, the nerves very hispid above the middle, the flat glabrous internerve marked with 2–5, rarely more, faint nerves, the second scale boat-shaped, thinner, 1-nerved, the nerve hispid above the middle, the fourth scale

with a flat somewhat twisted bent awn, 12–15 mm. long, its edges hispidulous; pedicellate spikelet a single nerved scale, on a pedicel shorter than the sessile spikelet with its terminal hairs less than twice as long as the sessile spikelet.

In dry sandy soil, southern Georgia and Florida. Type collected by the writer in the high pine land at Eustis, Lake Co., Fla., April 15–30, 1894, no. 473; nos. 146, 191, 426, 489, 595 and 1077 are also referred here. Dr. John K. Small obtained it also in Georgia in the St. Mary's River swamp below Trader's Hill, June 12–15, 1895. Nos. 4010 and 4952 of Mr. A. H. Curtiss, collected at Jacksonville, belong to this species. It is related to *A. argyraeus*, but it can at once be distinguished by its stouter and more silky racemes, and by the broader very thick first scale of the sessile spikelet with its less acuminate apex and its flat and glabrous internerve. In *A. argyraeus* the internerve is decidedly furrowed, at least when dry, probably due to its much thinner texture, and strongly hispidulous.

Andropogon Tracyi.

A tufted glabrous perennial, the basal leaves numerous and usually about one-half as long as the culms. Culms 5–8 dm. tall, branched above the middle, the nodes of the inflorescence usually barbed with long appressed silky hairs; sheaths shorter than the internodes; ligule scarious, about 0.5 mm. wide; blades erect, sparingly hirsute on the upper surface near the base, 1–2 dm. long and 2–3 mm. wide; inflorescence 2–3 dm. long, narrow, its branches erect; spathes 4–5 cm. long, acuminate, from slightly shorter than to exceeding the racemes; racemes in pairs, 3–4 cm. long, rather stout: sessile spikelets 5 mm. long, about twice as long as the stout internodes which are densely clothed with silvery white hairs a little more than one and one-half times as long as the spikelet, the awn 1.5–2 cm. long, sometimes a little spiral at the base; pedicellate spikelet wanting, or present as a minute rudimentary scale, the pedicel exceeding the sessile spikelet.

In dry soil, Alabama and Mississippi. Type collected by Prof. S. M. Tracy at Columbus, Miss., Oct. 14, 1895, no. 3083. Messrs. Earle and Baker also secured it at Auburn, Ala., on Oct. 14, 1897, and distributed it as *A. argyraeus*.

Its relationship with that species is not close, its affinities being with *A. Virginicus* and *A. longiberbis*, from the former of which it is distinguished by its glabrous sheaths and much stouter racemes; and from the latter, to which it is more nearly related, by the entire absence of the lanose pubescence so characteristic of *A. longiberbis*.

Paspalum Eggertii.

A tufted perennial. Culms 4–6 dm. tall, with usually a raceme-bearing branch in the sheaths; leaves 2; sheaths somewhat compressed, the basal ones pubescent, the others ciliate on the margin; ligule consisting of hairs about 1 mm. long; blades erect or nearly so, lanceolate or linear-lanceolate, glabrous, the lower ones 5–10 cm. long, 6–8 mm. wide, the uppermost blade smaller; racemes usually in pairs on the main culm, and generally single on the branches, the former ones long exserted, the latter partly included or somewhat exserted, 4–6 cm. long, the rachis narrowly winged, less than one-half as broad as the spikelets; spikelets about 2.2 mm. long and about 1.5 mm. wide, oval or a little obovoid, in pairs, the first scale densely pubescent with spreading hairs, 3-nerved, the second scale more sparingly pubescent, 2-nerved by the suppression of the midnerve, the flowering scale yellowish white, about one-half as thick as broad.

On sandy river-banks, Arkansas. Type in the herbarium of Columbia University, collected by Mr. H. Eggert near Pine Bluffs, Jefferson Co., Sept. 4, 1896. In general appearance somewhat suggesting *P. longepedunculatum* and distributed as that species by Mr. Eggert, but the leaf-blades are naked on the margins.

Paspalum geminum.

A glabrous or nearly glabrous perennial. Culms compressed, erect, from a decumbent base, 5–7 dm. tall; leaves about 5; sheaths compressed, keeled toward the summit; ligule scarious, about 3 mm. long; blades erect or nearly so, linear-lanceolate, flat, folded when dry, the lower ones 10–12 cm. long, 8–10 mm. wide, the uppermost blade very small: racemes usually 3, spreading, 4–6 cm. long, the rachis winged and about two-thirds as wide as the spikelets: spikelets in pairs, elliptic, about 3 mm. long and 2 mm. wide, the

outer 2 scales 5-nerved, the lateral nerves approximate at the fold, the flowering scale yellowish white, strongly papillose-roughened in longitudinal lines.

In clay soil, Florida. Type collected by the writer at Eustis, Lake Co., May 1–15, 1894, no. 680. In general habit and appearance it closely resembles *P. laeve*. The elliptic spikelets arranged in pairs furnish the most marked character separating it. In *P. laeve* the spikelets are broader and always singly disposed.

Paspalum longicilium.

A tufted perennial. Culms 6–12 dm. tall, erect, clothed with the overlapping sheaths; leaves 5–7; lower sheaths strongly hirsute with long hairs, the upper ones more sparingly so and ciliate on the margins; ligule scarious, brown, about 4 mm. long; blades erect, smooth and glabrous on both surfaces, acuminate at the apex, narrowed toward the base, the lower ones 3–5 dm. long and about 1.5 cm. wide, ciliate on the margins with hairs 3–4 mm. long: racemes 3–4, erect, about 1.5 dm. long, the rachis winged, about two-thirds as wide as the spikelets; spikelets singly disposed, rarely sometimes in pairs at the end of the racemes, 3.25–3.5 mm. long and about 2.5 mm. wide, oval, the outer 2 scales 5-nerved, the lateral nerves approximate at the fold, the flowering scale yellowish white, papillose-roughened in longitudinal lines.

In sandy soil along ditches, peninsular Florida. Collected by the writer at Eustis, Lake Co., July 16–31, 1894, no. 1359. Related to *P. giganteum* Bald., but separated readily by its pubescent sheaths and ciliate leaf-blades.

Paspalum longipilum.

A usually tufted perennial. Culms compressed; leaves usually 3, sometimes 4; sheaths much compressed, keeled, densely hirsute with very long rather weak hairs; ligule scarious, yellowish brown, 1.5–2 mm. long; blades erect, firm, flat, folded when dry, the lower ones 1.5–2 dm. long, 7–10 mm. wide, the lower surface glabrous, the upper densely pubescent with very long rather weak spreading hairs, the uppermost blade very short; racemes 2–4, rarely single, spreading or ascending, 5–7 cm. long, the rachis winged,

one-half to two-thirds as wide as the spikelets; spikelets singly disposed, broadly oval, about 2.75 mm. long and 2.25 mm. wide, the outer 2 scales 5-nerved, the lateral nerves approximate at the fold, the third scale yellowish white, papillose-roughened in longitudinal lines.

In sandy soil, peninsular Florida. Type collected by the writer at Eustis, Lake Co., June 16–30, 1894, no. 1027; nos. 507 and 1340 of the same collection, and no. 2080 of the collection of 1895, all secured at the same place, are also referred here. Related to *P. laeve* Michx., but the densely hirsute sheaths and upper surface of the leaf-blades at once distinguish it.

Aristida Mohrii.

A glabrous perennial. Culms very slender, leafy only toward the base, 5–7 dm. tall, erect; leaves 4; lowermost sheath distant from the others which are crowded and overlapping; ligule a scarious truncate ring about 1 mm. long; blades flat, erect, acuminate, usually 6–10 cm. long, and 1–2 mm. wide at the base, those on the innovations much smaller: raceme slender, long-exserted, 2–3 dm. long; spikelets scattered, shorter than the internodes, usually about one-half as long, appressed, the lower ones sometimes very distant; empty scales glabrous, equal in length, yellowish brown, acute, 1-nerved, 10–12 mm. long, the flowering scale shorter than the empty ones, 8–9 mm. long, its awns hispidulous, of equal thickness, widely spreading, flat and loosely spiral at the base, the spreading portion of the central one about 1.5 cm. long, that of the lateral ones a little shorter.

On sandy ridges, Alabama. Collected by Dr. Charles Mohr, in whose honor I take pleasure in naming it, at Spring Hill, Mobile Co., Oct. 4, 1886, and distributed as *A. simpliciflora;* also secured at the same place by B. F. Bush, Aug. 26, 1897, no. 5, and distributed as *A. stricta*. Related to *A. simpliciflora*, but abundantly distinct. In that species the spikelets are quite numerous and crowded with their empty scales smaller, the first scale strongly hispidulous, and the lateral awns of the flowering scale markedly more slender than the central awn.

A new Trisetum from Michigan.

By Geo. V. Nash.

TRISETUM BRITTONII sp. nov.

A densely tufted perennial, with the numerous innovations one-third to one-half as long as the culm. Culms erect, rigid, 2–3 dm. tall, villous toward the summit, leafless above; culm-leaf 1, near the base of the culm; sheaths softly pubescent; ligule scarious, about 0.5 mm. long; blades erect, that on the culm 1–2 cm. long, about 2 mm. wide, flat, those on the innovations longer, usually 6–10 cm. long, stiff, involute, at least when dry, 1.5 mm. or less wide when spread out, rough above, densely hirsute beneath with spreading hairs; panicle long-exserted, dense and contracted, spike-like, 2–4 cm. long, 5–7 mm. wide, its branches less than 1 cm. long, closely appressed; spikelets 4–4.5 mm. long, 2-flowered; empty scales acute, hispidulous on the midnerve above the middle, the first scale 1-nerved, about three-fourths as long as the 3-nerved second which is broadest at the middle; flowering scales scabrous, acute, the first one 3.5–4.5 mm. long, in sideview lanceolate and about 0.6 mm. wide, the hispidulous awn inserted about one-third way down, 2–2.5 mm. long, finally recurved, the palet usually about five-sixths as long as the scale; second flowering scale much smaller, about one-half as long, empty, bearing an awn longer or shorter than itself.

Collected by Dr. N. L. Britton, in whose honor I take pleasure in naming it, on Picnic Island, Marquette, Mich., July 19, 1883. Related to *T. subspicatum* (L.) Beauv., but clearly distinct, the numerous innovations with their stiff involute hairy leaf-blades and the narrow dense panicle with its short awns readily separating it.

The Genus Bumelia in North America.

By John K. Small.

My attention was especially called to the genus *Bumelia* during the summer of 1895, while in southern Georgia. I then realized that an attempt to segregate the North American species by means of one or another of the published syste-

matic interpretations of the genus was a hopeless task, for the reason that nearly one-half of the species growing in the southeastern United States had been ignored by monographers.

The first member of this group described from our territory was *Sideroxylon lycioides* L. Species Plantarum, Ed. 2, 279, 1762. In 1788 Walter described several species under *Sideroxylon*, while in the same year Swartz founded the genus *Bumelia*. Under this generic name species were described by Ventenat, Michaux, Nuttall, Rafinesque and Buckley.

The latest and best interpretation of the genus, that of Dr. Gray in the Synoptical Flora of North America (revised), recognizes five species and one variety. A study* of the genus covering a period of over five years, has led me to conclusions quite different from any heretofore published. They are expressed in the following pages.

Bumelia Sw. Prodr. 49. 1788.

Shrubs and trees of the southeastern United States and eastern tropical America. Thirteen species occur in the United States, while about thirty species are recorded as growing in the West Indies, Mexico and South America.

Leaf-blades glabrous, or merely with scattered hairs or inconspicuously cobwebby beneath.
  Fruit oblong-cylindric. 1. *B. angustifolia.*
  Fruit subglobose or oval.
    Leaf-blades of an obovate or spatulate type, mainly broadest above the middle.
      Twigs copiously pubescent with deep red hairs. 2. *B. rufotomentosa.*
      Twigs glabrous or soon becoming so.
        Fruit less than 8 mm. long.
          Corolla-lobes about 1.5 mm. long; leaf-blades blunt; fruit 5 mm. long. 3. *B. microcarpa.*
          Corolla-lobes about 2 mm. long; leaf-blades retuse; fruit 6–7 mm. long. 4. *B. reclinata.*

* Besides field observations, and the specimens in the herbaria of the New York Botanical Garden and Columbia University, I have been able to examine this genus as represented in the herbaria of the New York College of Pharmacy, Harvard University, Lafayette College, Franklin and Marshall College, and the National Herbarium.

Fruit over 9 mm. long.
Leaf-blades 1–3.5 cm. long ; fruit over 10 mm. broad.
5. *B. megococca.*
Leaf-blades 4–10 cm. long ; fruit less than 10 mm. broad.

Corolla-lobes erose-denticulate ; staminodia serrulate ; sepals glabrous. 6. *B. cassinifolia.*
Corolla-lobes entire ; staminodia entire ; sepals pubescent. 7. *B. monticola.*
Leaf-blades of an elliptic type, broadest at the middle.
Pedicels and sepals pubescent. 8. *B. Texana.*
Pedicels and sepals glabrous.
Corollas 3 mm. long ; lobes as broad as long ; leaf-blades not reticulated. 9. *B. lucida.*
Corollas 4 mm. long ; lobes longer than broad ; leaf-blades copiously reticulated. 10. *B. lycioides.*
Leaf-blades manifestly or copiously pubescent beneath.
Pubescence woolly, not at all lustrous.
Leaf-blades cuneate, mostly 1 3 cm. long. 11. *B. rigida.*
Leaf-blades not cuneate, mostly 4–10 cm. long.
12. *B. lanuginosa.*
Pubescence lustrous, white, becoming tawny, brown or coppery.
13. *B. tenax.*

1. Bumelia angustifolia Nutt.

Bumelia angustifolia Nutt. Sylva, 3 : 38, *pl. 93*. 1849.
Bumelia reclinata Torr. Bot. Mex. Bound. Surv. 109. 1853. Not Vent.
Bumelia parviflora Chapm. Fl. S. States, 275. 1860. Not A. DC.
Bumelia cuneata A. Gray, Syn. Fl. 2 : 68. 1878. Not Sw.

A glabrous depressed shrub, or a small tree reaching a height of 8 meters. Stems sometimes 15 cm. in diameter ; leaves persistent ; blades leathery, varying from narrowly oblanceolate-spatulate to obovate, cuneately narrowed at the base, 2–4 cm. long, entire, usually rounded at the apex, somewhat shining above, paler and dull beneath, short-petioled ; fascicles few-flowered or many-flowered, sometimes dense ; pedicels 3–6 mm. long, slightly thickened upward ; sepals ovate, 2 mm. long, obtuse, the inner much broader than the outer ; corolla-lobes suborbicular, erose-denticulate ; appendages narrowly-lanceolate, acuminate ; staminodia ovate or ovate-lanceolate, 2 mm. long, obtuse or acute, erose-dentate ; berries oblong, 1.5–2 cm. long, fleshy, edible.

Florida, on the peninsula and the keys, also in the lower Rio Grande valley, Texas and Mexico. Flowers in November and October, matures its fruit in the Spring.

The peculiar distribution of *Bumelia angustifolia* indicates the probability of there being two distinct species involved, one in Florida and another in the Rio Grande valley, but with the exception of a few minor and apparently unsatisfactory characters, the Floridian and Texano-Mexican plants seem to constitute a single species.

2. Bumelia rufomentosa n. sp.

A thorny shrub, with densely and deep red tomentose twigs and petioles. Stems stout, rigid, spreading or ascending, several dm. long, slightly zigzag; leaves firm; blades obovate or oval, 1.5–2 cm. long, obtuse or slightly retuse at the apex, more or less undulate, prominently reticulated, especially beneath, shining and becoming glabrous above, paler, dull and usually sparingly pubescent beneath with red hairs, on short slender petioles; fascicles many-flowered; pedicels slender, 2–3 mm. long, gradually enlarged upward, like the calyx, pubescent with straggling hairs; sepals suborbicular, nearly 1.5 mm. broad, the inner slightly larger than the outer-corolla; lobes suborbicular, often slightly broader than long, about 1.5 mm. in diameter; appendages ovate or ovate-lanceolate, acutish; staminodia ovate-lanceolate, a little over 1 mm. long, obtuse; berries subglobose, about 5 mm. in diameter.

In pine woods, peninsular Florida.

Tampa; May, 1876: *Garber*. (Type.)

Sumpterville; June, 1881: *Curtiss*.

3. Brumelia microcarpa n. sp.

A low shrub with zigzag branches and spreading thorn-armed twigs. Leaves firm; blades spatulate, oblanceolate or rarely oblong-obovate, rounded or acutish at the apex, lustrous and finely reticulated above, cobwebby pubescent beneath or glabrate in age, attenuate into slender petioles 2–6 mm. in length; clusters dense, on short scaly spurs; pedicels 1–4 mm. long, rather thinly tomentose: sepals suborbicular, concave, 1–1.5 mm. broad, tomentose or glabrous in age; corolla-lobes white, depressed orbicular, about 1.5 mm. broad,

rounded at the apex; appendages broadly lanceolate, 0.7 mm. long; staminodia lanceolate or ovate-lanceolate about 1 mm. long, barely acute: berries subglobose, 5 mm. in diameter.

In sandy soil, peninsular Florida.

Gainsville; March and June, 1876: *Garber*. (Type.)

Related to *Bumelia reclinata*, but smaller and more rigid The branchlets or twigs are more copiously armed with thorns, while the parts of the flower and the berries are smaller. The thin arachnoid pubescence on the lower surface of the leaf-blades and the pedicels, and the abbreviation of the latter are diagnostic characters.

4. Bumelia reclinata Vent.

? *Sideroxylon laeve* Walt. Fl. Car. 100. 1788.

Bumelia reclinata Vent. Choix, 22. 1803.

A low decumbent or ascending armed glabrous shrub, 1–2 meters tall, the spine-like branches often leafy and producing flowers. Stem commonly zigzag or somewhat twisted; leaves numerous; blades thinnish, oblanceolate ovate, obovate or spatulate, 2–5 cm. long, rounded or retuse at the apex, deep green and shining above, paler, and dull beneath, somewhat prominently reticulate, narrowed into petioles, varying from 2 to 4 mm. in length; fascicles few-flowered; pedicels glabrous, 3–5 mm. long, enlarged upward; sepals broadly ovate or orbicular-ovate, 1.8 mm. long; berries oval, 6–7 mm. long.

In sandy soil, Georgia to Florida and Louisiana.

Georgia: Banks of the Ochlockonee River, Thomasville; *Small*.

Florida: Banks of the Chipola River, Jackson Co.: *Chapman*.

Louisiana: *Hale*.

5. Bumelia megococca n. sp.

An evergreen glabrous thorny shrub, with spreading or procumbent branches. Bark pale, raised in angular corky ridges which are broken by numerous lenticels; leaves few; blades leathery, obovate or oblong-oblanceolate, 1–3.5 cm. long, obtuse or retuse at the apex, deep green and somewhat shining above, paler and prominently reticulated beneath,

slightly revolute, short-petioled; pedicels stout, 1–3 mm. long: berries globose or oblong-globose, 11–13 mm. in diameter, black; seeds 9–10 mm. in diameter, pale, smooth and shining, variegated.

In sandy soil, Florida.

Tampa, October, 1877; *Garber*. (Type.)

A species of remarkably rigid and stout habit, interesting on account of its spreading or procumbent stems or branches which trail more or less extensively in the sand, and its very large fruit which excels in size that of any of our native species.

6. Bumelia cassinifolia n. sp.

A glabrous or glabrate commonly armed shrub, or small tree, 5–10 meters tall, the twigs and the lower surfaces of the leaves puberulent. Stem rarely more than 16 cm. thick, clothed with a reddish brown bark; leaves numerous; blades thinnish, oblong-obovate, or oblanceolate, 2–10 cm. long, rounded or retuse at the apex, undulate, narrowly revolute, dark green above, somewhat paler beneath, the main nerves slightly prominent beneath; petioles slender varying from 8–12 mm. in length; fascicles many-flowered; pedicels glabrous, 2–5 mm. long, slightly enlarged upward; sepals suborbicular, 2 mm. long, the inner with a broad scarious margin; corolla-lobes suborbicular, 1.5–2 mm. in diameter, often erose-toothed; appendages lanceolate or ovate-lanceolate, crisped or erose; staminodia ovate, about 2 mm. long, obtuse, serrulate; berries oval or globose-oval, 1–1.5 cm. long.

In sandy soil, Louisiana.

Opelousas. May and August 1883; *Letterman*. (Type.)

A relative of *Bumelia reclinata* but erect and much taller; differing also in the erose-toothed petals and the serrulate boat-shaped staminodia. The appendages of the corolla are obtuse, not acute as in *B. reclinata*.

7. Bumelia monticola Buckl.

Bumelia monticola Buckl. Bull. Torr. Club, **10**: 91. 1883.

A straggling thorny shrub 1–3 meters tall, the petioles, nerves

of the lower surface of the leaf-blades and inflorescence sparingly pubescent. Stem clothed with a reddish-brown bark; leaves stiff; blades spatulate or oblong-oblanceolate, rounded and often slightly apiculate at the apex, slightly revolute, usually acuminate or cuneately narrowed at the base, the nerves prominent and reticulate on the pale under surface, not prominent on the dark green upper surface; petioles slender, 3–8 mm. long; fascicles often many-flowered; pedicels slender, much thickened toward the apex; sepals suborbicular, about 2 mm. long, the inner slightly broader than the outer; corolla-lobes suborbicular, a little broader than long, about 1.5 mm. in diameter; appendages lanceolate, rather obtuse; staminodia ovate-lanceolate obtuse or acutish, less than 2 mm. long: ovary hairy; berries elliptic, 1–1.3 mm. long, often tipped by the persistent style; seeds subglobose, slightly longer than thick.

In dry soil, western and southern Texas. Spring and summer.

8. Bumelia Texana Buckl.

Bumelia Texana Buckl. Bull. Torr. Club, 10: 90. 1883.

A rigid somewhat thorny shrub or small tree, several meters tall, glabrous or with a slight inconspicuous pubescence on the petioles, and midrib of the leaf-blades beneath. Leaves firm; blades leathery, oval or oblong, 2–3 cm. long, rounded, truncate or retuse at the apex, hardly revolute, prominently nerved and pale green on both surfaces, sometimes cuneately narrowed at the base; petioles slender, 5–10 mm. long; fascicles few-flowered; pedicels stoutish, 1–3 mm. long; berries oblong or elliptic, about 1 cm. long.

On the mountains near the lower crossing of the Pecos River, western Texas, 1876, *Buckly*.

Not recently collected; apparently a distinct species.

9. Bumelia lucida n. sp.

A glabrous shrub, or small tree, 2–7 meters tall, with rigid thorny branches. Leaves numerous; blades leathery, elliptic varying to elliptic-ovate or elliptic-oblanceolate, 2–5 cm. long, acute or obtuse at both ends, deep green shining and hardly reticulated above, paler dull and prominently reticulated beneath; petioles slender, 2–5 mm. long; fascicles rather many-flowered; pedicels glabrous, slender, 3–7 mm. long, very slightly if at all enlarged at the apex; sepals suborbicu-

lar, about 2 mm. in diameter, the outer somewhat smaller than the inner; corolla-lobes suborbicular; appendages lanceolate, obtuse; staminodia ovate, 2 mm. long, sometimes inequilateral, obtuse; berries mostly oval, about 7–8 mm. long.

Louisiana: Feliciana, 1838; *Carpenter*, no. 19.
Featherman, no. 95.
Riddell.

Related to *Bumelia lycioides* but smaller in all its parts. The sepals are rather broader than long, instead of longer than broad as is the case in *B. lycioides*, and the corolla-lobes usually subcordate at the base. The staminodia are abruptly contracted or subcordate at the base instead of cuneate and boat-shaped, and they are much less rigid.

10. Bumelia lycioides (L.) Gaertn.

Sideroxylon lycioides L. Sp. Pl. Ed. 2, 279. 1762.
Bumelia lycioides Gaertn. Fr. et Sem. 3: 127, *pl. 202.* 1805.

A glabrous usually armed shrub, or small tree, reaching a height of 8 meters. Stem clothed with a gray bark; leaves numerous; blades thickish but barely leathery, oblong, elliptic or rarely oblanceolate, 4–12 cm. long, acute or acuminate or rarely rounded at the apex, pale green and prominently reticulate on both surfaces, narrowed into petioles which are 5–12 mm. long; fascicles densely flowered; pedicels slender, 7–10 mm. long, hardly enlarged at the apex; sepals oval, or orbicular-ovate, 2 mm. long, the inner somewhat broader than the outer; corolla-lobes longer than broad; appendages lanceolate or ovate-lanceolate; staminodia ovate, 2–2.5 mm. long, boat-like, obtuse, often keeled; ovary hairy; berries oval, fully 1 cm. long.

In low or damp soil, Virginia to Illinois, south to Florida and Texas. Flowers in summer and matures its fruit in the fall.

11. Bumelia rigida (A. Gray).

Bumelia lanuginosa var. *rigida* A. Gray, Syn. Fl. N. A. **2**: Part 1, Ed. 2. 1886.

A low tree with rigid spreading branches. Leaves numerous; blades cuneate or oblong-cuneate, 1.5–3 cm. long, rounded or retuse at the apex, dark green and glabrous above,

woolly beneath; petioles 1–3 mm. long; fascicles rather few-flowered; pedicels 4–8 mm. long, slightly thickened above; sepals suborbicular, 2 mm. long, the inner somewhat larger than the outer; corolla-lobes suborbicular, 2 mm. in diameter, truncate at the base, erose; appendages lanceolate or ovate-lanceolate, acute; staminodia ovate-lanceolate, erose, obtuse: ovary hairy; berries oblong-oval or oval, 10–12 mm. long, often tipped by the persistent style.

Along streams, Texas to Arizona.

More rigid and contracted in habit than any form of *Bumelia lanuginosa*. Generally separable by the smaller cuneate type of leaf-blades and the softer and more silky character of the woolly pubescence.

12. Bumelia lanuginosa (Michx.) Pers.

? *Sideroxylon tenax* Walt. Fl. Car. 100. 1788. Not L.

Sideroxylon lanuginosum Michx. Fl. Bor. Am. **1**: 122. 1803.

? *Bumelia oblongifolia* Nutt. Gen. **1**: 135. 1818.

Bumelia lanuginosa Pers. Syn. **1**: 273. 1805.

Bumelia arachnoidea Raf. New Fl. **3**: 28. 1836.

Bumelia tomentosa A. DC. in D C. Prodr. **8**: 190. 1844.

? *Bumelia ferruginea* Nutt. Sylva, **3**: 34. 1849.

Bumelia arborea Buckl. Proc. Acad. Phila. **1861**: 462. 1862.

Bumelia pauciflora Engelm; A. Gray, Syn. Fl. **2**: 68. As synonym. 1878.

An armed or thornless shrub, or tree 3–20 meters tall, its twigs, the lower surface of the leaves and the inflorescence tomentose with pale or reddish, never lustrous, hairs. Stems rarely becoming nearly 1 meter thick; leaves various; blades oblong-oblanceolate, oblong-obovate or elliptic, acutish, rounded or retuse at the apex, glabrous above, gradually or cuneately narrowed at the base; petioles 2–15 mm. long; fascicles few- or many-flowered; pedicels 5–8 mm. long, considerably enlarged towards the base of the calyx; sepals suborbicular or orbicular-ovate, about 3 mm. long, concave; corolla-lobes orbicular-ovate, 2 mm. long; appendages ovate-lanceolate or lanceolate, acute or acutish; staminodia ovate, acute or acutish, usually erose-denticulate, about as long as

the petals; ovary hairy; berries oval or obovoid-oblong, 10–15 mm. long.

In sandy soil, Missouri and Kansas to Georgia, Florida and Texas. Flowers in summer, fruits in the fall.

It is quite likely that *Bumelia lanuginosa*, as it is understood at present is a composite species, but we have not yet sufficient material from many parts of the vast area over which the plant extends, to warrant segregation. There are conspicuous differences exhibited in habit, character and quantity of the pubescence, size of the flowers, and leaf-form, but as yet I have not been able to correlate these differences with distinct specific lines.

13. Bumelia tenax (L.) Willd.

Sideroxylon tenax L. Mant. 48. 1768.
Chrysophyllum Carolinense Jacq. Obs. 3: 3, *pl. 54*. 1768.
Sideroxylon sericeum Walt. Fl. Car. 100. 1788.
Bumelia chrysophylloides Pursh, Fl. Am. Sept. 155. 1814.
Bumelia tenax Willd. Sp. Pl. 1: 1085. 1798.
Sideroxylon chrysophylloides Michx. Fl. Bor. Am. 1: 123. 1803.
Scleroclados tenax Raf. Sylva Tell. 35. 1838.
Scleroxus tenax Raf. Aut. Bot. 73. 1840.

An unarmed or thorny shrub, or small tree, 2–9 meters tall, its twigs, the lower surface of the leaf-blades and the inflorescence clothed with a lustrous silky pubescence, at first whitish, becoming tawny or brownish. Stem seldom over 16 cm. in diameter; leaves numerous; blades oblanceolate, obovate-spatulate or obovate (those of the twigs sometimes inclined toward oblong-elliptic), 2–7 mm. long, obtuse or retuse, glabrous above, slightly revolute; petioles 2–5 mm. long; fascicles many-flowered; pedicels slender, 8–13 mm. long, or rarely shorter, very slightly enlarged upward; sepals concave, suborbicular, 1–5.2 mm. long, erose-denticulate or entire, rounded at the apex or notched; appendages ovate or ovate-lanceolate, often erose on one side; staminodia ovate, 1.5–2 mm. long, obtuse; berries obovoid or oblong-obovoid, 10–14 mm. long, often tipped by the slender persistent style.

In thickets and sandy soil, mostly near the coast, North Carolina to Cape Canaveral and Cedar Keys, Florida. Flowers during the spring, matures its fruit in the fall.

Descriptions of new North American Thorns.

By N. L. Britton.

Crataegus Brownii n. sp.

A shrub, glabrous throughout. Spines slender, 2–3 cm. long; leaves obovate to oval-obovate, obtuse or obtusish at the apex, narrowed or cuneate at the base, thin, irregularly crenate with distinctly rounded teeth, slender-petioled, 4–6 cm. long, some of them occasionally flabellate; corymbs 5–8 cm. broad, 8–15 flowered; pedicels slender; bracts linear, very glandular; flowers about 1.5 cm. wide.

Type from Buchanan, Va., collected by Hon. Addison Brown, May 19, 1892; collected also by Dr. John K. Small, on Kate's Mountain, near White Sulphur Springs, W. Va., May 16, 1892. Both specimens in the herbarium of Columbia University.

Crataegus Eggertii n. sp.

Thorns 3–6 cm. long. Foliage sparingly pubescent when young, glabrous when mature; leaves ovate-orbicular, often as broad as long, dull green above, pale beneath, sharply and irregularly serrate or somewhat lobed, mostly truncate or subcordate at the base, acute or acutish at the apex, slender-petioled, 5–12 cm. long; pedicels and calyx glabrous or nearly so; flowers 2–2.5 cm. broad; corymbs several-flowered; bracts very glandular; fruit subglobose, large, sometimes nearly 2 cm. in diameter, glaucous.

Type from St. Louis, Mo., in woods in clay soil, collected by H. Eggert, May 9 and October 9, 1887; specimens in herbarium of Columbia University. The following specimens have also been studied:

Missouri: Courtney, July 12, 1892, B. F. Bush; Dodson, B. F. Bush, July 18, 1899; Monteer, B. F. Bush, July 26, 1899.

Kansas: Riley Co., J. B. Norton, April 27, 1895.

Crataegus Porteri, n. sp.

A glabrous shrub. Leaves ovate, dark green and shining above, paler beneath, 6–10 cm. long, 3–5 cm. wide, sharply irregularly serrate and slightly lobed, the base narrowed or cuneate, the apex acute, the slender petiole about one-third the length of the blade; pedicels slender; fruit pyriform, about 1.4 cm. long and 1 cm. in diameter, pruinose; calyx-lobes entire.

Type collected by myself at Tannersville, Monroe Co., Penn., July 4, 1896, in company with Prof. Thos. C. Porter of Lafayette College, and preserved in the herbarium of Columbia University.

The species differs from *C. pruinosa* (Wendl.) Beadle (*Mespilus pruinosa* Wendl.), in its pyriform, not globose pomes, and thicker firm and shining leaves.

Crataegus occidentalis n. sp.

A shrub or small tree, sometimes 6–7 m. high. Thorns slender, about 3 cm. long; pedicels and calyx pubescent; leaves oval or slightly obovate, irregularly serrate and sometimes slightly lobed, mostly obtuse at the apex, and narrowed or subcuneate at the base, 4–7 cm. long, 3 or 4 cm. wide, slender-petioled, pubescent beneath, at least on the veins; corymbs several-flowered; flowers about 1.5 cm. wide; fruit oval-globose, about 1 cm. long.

Types in herbarium of Columbia University collected by Prof. E. L. Greene, near Golden, Colo., 1873, along streams, in flower; on river-bank near the Forks of Dismal River, Hooke Co., Nebr., collected by Dr. P. A. Rydberg, July 11, 1893, in fruit. The species is, perhaps, nearest related to *C. tomentosa* L. Also collected by Mr. R. S. Williams at Columbia Falls, Mont., May 19, 1897 (Herb. N. Y. Bot. Garden).

Crataegus tenuifolia n. sp.

A shrub, the thorns slender, slightly curved, 5–6 cm. long. Leaves very thin, even when mature, ovate, acute or short-acuminate at the apex, narrowed, or some of them subtruncate at the base, incised-serrate and lobed, 6–10 cm. long, with short hairs on the upper surface, the very slender petiole half

the length of the blade, or more; pedicels slender; fruit pyriform, over 1 cm. long, 8–9 mm. thick; calyx-lobes glandular-serrate.

Type from south fork of the Holston River, Va., collected by myself, June 15, 1892, preserved in herbarium of Columbia University.

Crataegus campestris n. sp.

Thorns stout, 4–6 cm. long; mature leaves firm, densely and finely pubescent and prominently straight-veined beneath, dull and with short scattered hairs above, 6–9 cm. long and nearly as wide, sharply and somewhat irregularly serrate; pedicels slender, pubescent; fruit globose, 1–1.5 cm. in diameter, pubescent when young.

Type in herbarium of the New York Botanical Garden, collected by B. F. Bush in woods, Tarsney, Mo., July 3, 1898. Also found by the same collector at Dodson, Mo., July 18, 1899, and by Professor A. S. Hitchcock in Cherokee Co., Kansas, in 1896.

Crataegus pyriformis n. sp.

Twigs light gray. Leaves broadly oval, or obovate-oval, dull, 6–8 cm. long, when mature glabrous above, pubescent, especially on the veins beneath, rather finely serrate nearly all around, not lobed, the blade decurrent into the petiole; pedicels slender; fruit pyriform, about 1 cm. long.

Type from Monteer, Mo., along river bottom, collected by B. F. Bush, August 16, 1899, preserved in herbarium of the New York Botanical Garden.

INDEX.

[Names of Genera in *italic*.]

Abies, 230, 236, 372, 377
Abronia, 209
Abutilon, 137, 216, 239, 353, 382
Acacia, 137, 239, 381
Acaena, 137, 212, 350
Acalypha, 137, 200, 381
Acanthopanax, 137, 230, 370
Accessions, 113, 127, 185, 317, 326, 394
Acer, 137, 200, 230, 234, 370, 375
Acerates, 218, 356
Achillaea, 137, 202, 223, 361
Achryophorus, 222
Acokanthera, 384
Aconitum, 137, 210, 348
Acorus, 137, 197, 206, 343
Acroclinium, 223
Actaea, 137, 210, 348
Actinella, 137, 223, 361
Actinidia, 235, 371, 376
Actinomeris, 361
Act of Incorporation, 1
Act of Incorporation, Amendment to, 54
Adenophora, 222, 360
Adiantum, 137, 203, 236, 341, 377
Admission and Registration of Students, Regulations for, 418
Adonis, 137, 210, 348
Adopogon, 137, 202, 222, 360
Aerides, 137, 237, 379
Aeschynanthus, 385
Aeschynomene, 213, 351, 381
Aesculus, 137, 227, 234, 367, 370, 376
Aethionema, 137
Agapanthus, 378
Agastache, 137, 219, 357
Agasyllis, 217
Agave, 137, 237, 345, 378
Ageratum, 137, 361
Aglaonema, 236, 378
Agreement with Columbia University, 19
Agrimonia, 137, 199, 212, 350
Agropyron, 137, 196, 204, 342
Agrostemma, 137, 209, 347
Agrostis, 137, 196, 204, 342
Ailanthus, 137, 200, 230, 370
Ajuga, 137, 219
Akebia, 138, 232, 371
Alchemilla, 138, 212, 350
Aletes, 217, 355
Aletris, 138, 206, 278, 344
Alfredia, 361
Alisma, 138, 196
Allionia, 209, 347
Allium, 138, 197, 206, 279, 344, 393
Allotment of the Grounds, 49
Alnus, 138, 198, 226, 229, 231, 365, 369
Alocasia, 236, 378
Aloe, 138, 237, 378
Alpinia, 237, 379
Alsine, 138, 199, 209, 347
Alsophila, 236, 377
Alternanthera, 347
Althaea, 138, 216, 353
Alyssum, 138, 211, 349
Amaranthus, 138, 208, 347
Amaryllis, 138, 237, 345, 378
Amblystegium, 393
Ambrosia, 138, 202, 222, 361
Amelanchier, 138, 227, 233, 366
Amellus, 361
Amendment to the Act of Incorporation, 54
Amethystea, 138
Ammi, 355
Ammobium, 361
Ammophila, 204
Amorpha, 138, 213, 227, 351, 366
Ampelopsis, 138, 371
Amsonia, 138, 218, 356
Amygdalus, 233, 366
Anacyclus, 361
Anagallis, 138, 218, 356
Anaphalis, 138, 223, 361
Anchusa, 138, 219, 357
Andrographis, 385
Andromeda, 138, 376
Andropogon, 138, 196, 204, 342, 431
Androsace, 218, 356
Andryala, 138
Anemone, 138, 199, 210, 348
Angelica, 217, 355
Angraecum, 379
Anoda, 138, 216, 353
Annual Members, 112
  List of 56, 98, 243
  Provisions for Patrons, Fellows for life, and 7
  Report of Committee on Patrons, Fellows, and 98, 243
Anogra, 217
Anomodon, 195, 393
An outline of Research subjects offered by . . . New York Botanical Garden and . . . Dept. of Botany Columbia University, 416
Antennaria, 138, 202, 223, 361
Anthemis, 138, 223, 361
Anthericum, 138, 237, 378
Anthoceros, 195
Antholyza, 379
Anthoxanthum, 138, 196, 204, 342

Anthurium, 138, 236, 378
Anthyllis, 213, 351
Antirrhinum, 138, 358
Anychia, 138, 199, 347
Apios, 138, 200
Apium, 138, 217, 355
Aplectrum, 207, 346
Aplopappus, 223, 361
Appropriations, Expenditures under, 116, 134, 193, 397
Apocynum, 138, 201, 218, 356
Apodanthera, 222
Aquilegia, 138, 199, 210, 280, 348
Arabis, 139, 199, 211, 349, 393
Arachnospermum, 223
Aralia, 139, 201, 217, 227, 230, 355, 367 370
Araujia, 385
Arboretum, 228
  Deciduous, 34
  List of Families in the (including Pinetum), 387
Arctium, 139, 202, 223, 361
Arctostaphylos, 235, 356
Arctotis, 362
Areas, Forest, 42
  Reserve, 46
Areca, 139, 236
Arenaria, 139, 199, 209, 347
Arethusa, 207
Argemone, 210, 349, 381
Argentina, 212, 350
Ariocarpus, 382
Arisaema, 139, 197, 206, 343
Aristida, 139, 196, 393, 436
Aristolochia, 139, 208, 346, 371, 380
Arnica, 139, 223, 362
Aronia, 139, 227, 366
Arrhenatherum, 204, 342
Artemisia, 139, 223, 362, 368
Arum, 139
Aruncus, 139, 212, 350
Arundinaria, 139
Arundinella, 139, 204, 342
Arundo, 204, 342
Asarum, 139, 198, 208, 346
Asclepias, 139, 201, 218, 356, 385
Ascyrum, 139, 216
Asimina, 139, 226, 365
Asparagus, 139, 198, 207, 237, 345, 378
Asperula, 139, 221, 359
Asphodeline, 139, 206, 344
Asphodelus, 344
Aspidistra, 378
Asplenium, 139, 195, 203, 341, 377
Assistant, General, Report of, 337
Aster, 139, 202, 223, 362
Astilbe, 139, 212, 350
Astomum, 392
Astragalus, 139, 213, 351
Athyrium, 203
Atragene, 232, 373
Atraphaxis, 231, 365
Atriplex, 140, 208, 346
Atropa, 140, 220, 358
Aubrietia, 211, 349
Aucuba, 384
Aulacomnium, 392
Avena, 140, 196, 204, 342
Azalea, 140, 201, 235, 368, 376

Baccharis, 368
Baeria, 140
Ballota, 219, 357
Baptisia, 140, 351
Barbarea, 140, 199, 211, 349
Barbula, 195
Barkhausia, 222
Bartramia, 392
Basella, 347
Batrachium, 348, 393
Bazzania, 195
Beaucarnea, 378
Begonia, 140, 239, 382
Benzoin, 140, 199, 226, 365
Berberis, 140, 226, 232, 365, 374
Berkheya, 140, 362
Berteroa, 140
Berula, 217
Bessera, 206
Beta, 140, 208, 346
Betonica, 357
Betula, 140, 198, 226, 229, 231, 365, 369, 373
Bicuculla, 140, 199, 211, 349
Bidens, 140, 202, 223, 362
Bigelovia, 223
Billbergia, 237, 378
Biscutella, 140, 211, 349
Biserrula, 351
Blechnum, 140, 377
Blephilia, 140
Bletia, 379
Blitum, 140
Board of Estimate and Apportionment, Resolutions of, 14, 91, 95
Board of Managers, Expenditures under Appropriations made by, 116
  Schedule of Expenditures during 1897 under Appropriations made by the, 134
  Schedule of Expenditures during 1898 under Appropriations made by the, 193
  Schedule of Expenditures during 1899 under Appropriations made by the, 397
Bocconia, 140, 211, 349
Boehmeria, 140, 198
Boltonia, 140, 223, 362
Borders, 27
Borders, Nurseries and, List of Families in, 388
Botanical Contributions, 257, 419
Botanical Exploration of Porto Rico, 182, 309
Botanical Garden, List of Plants in the Grounds of the New York . . ., and in the Temporary Greenhouse, 137
  Map, 170
  Plan of the New York, 62, 86
Botany, Dept. of Columbia University, An outline of Research subjects offered by . . . New York Botanical Garden and . . ., 416
Botany of Montana, 182
Botrychium, 195, 203, 341, 393
Bougainvillea, 238, 381

Bouteloua, 140, 204
Bowlesia, 355
Brachycheila, 384
Brachypodium, 204, 342
Brachythecium, 195, 393
Bradburya, 381
Brassia, 140, 237, 379
Brassica, 140, 211, 349
Brauneria, 140, 223, 362
Briza, 140, 204, 342
Brodiaea, 140
Bromus, 140, 196, 204, 342
Bronx, The, 40
Bronx Park Sewer, Williamsbridge and, 110, 125
Bronx River, Diversion from its old channel, 78
Map of the Lower, 81
Broussonetia, 140, 229, 369
Brugmansia, 385
Bryophyllum, 381
Bryophyta, 195, 392
Bryum, 195, 392
Buddleia, 140, 235, 368
Building, Museum, Description of the, 167
Buildings and their Locations, 30, 174, 297
Bulbilis, 140, 204, 342
Bulbine, 140, 344
Bulletin, 112
Bumelia, The Genus in North America, 437
Bunias, 140, 211, 349
Buphthalmum, 140, 223, 362
Bupleurum, 140, 217, 355
Bursa, 140
Butneria, 140, 226, 232, 365
Buxbaumia, 195
Buxus, 234, 367, 375
By-Laws, 9

Cacalia, 140, 223
Cactus, 140, 217, 239, 354, 382
Caladium, 206, 343
Calamagrostis, 141, 196, 204, 342
Calamintha, 141
Calamovilfa, 141, 204, 342
Calandrinia, 141, 209, 347
Calanthe, 141, 237
Calceolaria, 141
Calendula, 141, 228, 362
Calimeris, 362
Calisace, 217
Callicarpa, 141, 228, 368
Callirrhoë, 141, 216, 283, 353
Callistemon, 384
Callistephanus, 362
Callitriche, 353, 393
Calocasia, 343
Calochortus, 206
Caltha, 141, 210
Camelina, 211
Camellia, 382
Campanula, 141, 202, 222, 360, 385
Camptosorus, 141, 203, 341
Canna, 207, 346, 379
Cannabis, 141
Capnoides, 141, 199, 211, 349
Capsicum, 385
Caragana, 141, 213, 227, 234, 366, 375
Carbenia, 141
Cardamine, 141, 199, 211
Cardiospermum, 141, 239, 382
Carduus, 141, 203, 223, 362
Care of the Grounds, 110, 125. 180, 305
Plantations, 108
Carex, 141, 197, 205, 343, 378
Carica, 382
Carlina, 223, 362
Carpinus, 141, 198, 229, 231, 369, 373
Carthamus, 141, 362
Carum, 141, 217, 355
Caryopteris, 141, 219, 357
Cassia, 141, 200, 213, 239, 351, 381
Castalia, 141, 199, 231, 348, 373
Castanea, 141, 198, 229, 231, 369, 373
Castilleja, 220, 358
Catalogue, Card, 340
Catalpa, 141, 230, 371
Catananche, 141, 223, 362
Catasetum, 379
Catherinea, 195, 392
Cattleya, 141, 237, 379
Caucalis, 217
Caulophyllum, 142, 210, 349
Caylusea, 142
Ceanothus, 142, 200, 227, 234, 367, 376
Cedrela, 142, 229, 370
Celastrus, 142, 200, 234, 371
Celosia, 209
Celsia, 142, 220, 358, 385
Celtis, 142, 198, 229, 369
Cenchrus, 142, 196
Cenia, 142
Centaurea, 142, 223, 362, 377
Centranthus, 142, 221, 360
Cephalanthus, 142, 202
Cephalaria, 142, 221, 360
Cephalozia, 195
Cerastium, 209, 347
Ceratodon, 195
Cercidophyllum, 142, 226, 229, 365, 369
Cercis, 142, 227, 234, 366, 375
Cercocarpus, 233, 374
Cereus, 142, 239, 354, 382
Cerinthe, 219, 357
Cespitose Willows of Arctic America and the Rocky Mountains, 257
Cestrum, 242, 385
Chaetochloa, 142, 196, 204, 342
Chamaecyparis, 142, 230, 369, 372
Chamaedaphne, 142, 368
Chamaelirium, 206, 344
Chamaenerion, 217, 355
Chamaepeuce, 363
Chamaerops, 142, 236, 378
Channel, Diversion of the Bronx from its old, 78
Chareis, 142, 360
Charter of the Greater New York, Provisions of, 96, 97
Cheilanthes, 203
Cheiranthus, 142, 211
Chelidonium, 142
Chelone, 142, 220, 358, 393
Chenopodium, 142, 199, 208, 346
Chimaphila, 142, 201, 218, 356

Chionanthus, 142, 228, 368
Chrosperma, 344
Chrysalidocarpus, 378
Chrysanthemum, 142, 203, 224, 242, 363, 385
Chrysopsis, 224
Chrysosplenium, 393
Cicer, 143, 351
Cichorium, 142, 202, 222
Cicuta, 143, 201, 217, 355
Cimicifuga, 143, 210, 348
Cinna, 143, 196
Circaea, 143, 201, 217, 355
Cirriphyllum, 195
Citrus, 143, 227, 367, 381
Cladosporium, 425
Cladrastis, 143, 234, 375
Clarkia, 143
Claytonia, 143, 209, 347
Clematis, 143, 199, 210, 232, 348, 371, 373
Cleome, 143, 211, 349
Clerodendron, 368
Clethra, 143, 201, 228, 367, 376
Climacium, 195
Clinopodium, 219, 357
Clintonia, 345
Clitoria, 239, 381
Clivia, 378
Clypeola, 349
Cneorum, 381
Cnicus, 224, 363
Cobalium, 222
Coccoloba, 143, 238
Cocculus, 371
Cocos, 143, 236
Codiaeum, 381
Coelogyne, 143, 237, 379
Coix, 143, 204, 342
Cola, 239
Coleosanthus, 224, 363
Coleus, 385
Collection, Herbaceous, 203
Collections, Economic, Report of the Honorary Curator of, 252, 322
Collinsia, 143
Collinsonia, 143, 219, 357
Collomia, 143, 356
Columbia University, Agreement with, 19
Herbarium and Botanical Library of, 298
Outline of Research subjects offered by New York Botanical Garden and Dept. of Botany, 416
Colutea, 143, 213, 234, 351, 366, 375
Comandra, 143, 198, 208, 346
Comarum, 143, 212, 350
Combretum, 384
Commelina, 143, 206, 343, 378
Commission, Report of the Plans, 23
Commissioners of Public Parks, Resolutions of, 13, 14, 90
Committee on Patrons, Fellows and Annual Members, Report of, 98 243, 401
On Plans, Report of, 47, 87
Comocarpa, 212, 365
Comptonia, 143, 198, 225, 364
Conium, 143, 217, 355
Conringia, 143,
Constitution, 8
Construction of the Jerome Park Reservoir, Temporary Railway for, 111, 125
Contract for Construction of Museum Building, 92
for Construction of Horticultural Houses, 175
Contributions, Botanical, 257, 419
Convallaria, 207, 345
Convolvulus, 143, 201, 218, 242, 356, 371 385
Conyza, 224
Cooperia, 207, 345
Corallorhiza, 143, 425
Corchorus, 143
Cordyline, 378
Coreopsis, 143, 224, 363
Coriandrum, 143, 217
Coriaria, 143, 234
Corispermum, 347
Cornus, 143, 201, 227, 230, 235, 367, 370 376
Coronilla, 143, 213, 227, 351, 366
Corporation, Members of the, 5
Corrigiola, 347
Corylopsis, 143, 226, 365
Corylus, 143, 198, 225, 231, 365
Corynephorus, 204
Corypha, 378
Cotinus, 143, 227, 230, 367, 370
Cotoneaster, 143, 227, 233, 366, 375
Cotyledon, 350
Cousinia, 363
Crambe, 143
Crassula, 238, 381
Crataegus, 143, 200, 227, 229, 233, 366, 370, 375, 447
Crepis, 143, 222, 360
Crinum, 143, 207, 237, 345, 378
Crotalaria, 143, 200
Crucianella, 143, 221, 360
Cryptogramme, 203
Cryptomeria, 143, 230, 372
Cryptostemma, 224
Cubelium, 216, 354
Cucurbita, 377
Cucumus, 377
Cultivation, List of Families under, in the various Plantations, 390
Cunila, 219, 357
Cupressus, 230, 372
Curator, Honorary, of Economic Collections, Report of, 252, 322
Of the Museums, Report of, 311
Curculigo, 378
Cuscuta, 143, 201
Cyanotis, 378
Cycas, 144, 236, 377
Cyclamen, 241, 384
Cyclanthera, 144, 222
Cycloloma, 144
Cydonia, 366
Cymbalaria, 359
Cymbidium, 144, 237, 379
Cynanchum, 218, 356
Cynara, 144, 224
Cynoglossum, 144, 219, 357

Cynosurus, 144, 204
Cyperus, 144, 197, 206, 236, 343, 378
Cypripedium, 144, 207, 237, 346, 379
Cyrtodeira, 242, 385
Cyrtomium, 236, 377
Cystopteris, 195, 203, 341
Cytisus, 144, 234, 351, 366, 375

Dactylis, 144, 196, 204, 342
Dahlia, 224, 363
Dalibarda, 212
Danthonia, 144, 196, 204, 342
Daphne, 144, 235, 376
Dasyphora, 350
Dasystoma, 144, 285
Datura, 144, 220, 358
Daucus, 144, 201, 217, 355
Davallia, 377
Deciduous Arboretum, 34
Decodon, 354
Decorative Grounds, 34
Delphinium, 144, 210, 348
Dendrium, 356, 368
Dendrobium, 144, 238, 380
Dennstaedtia, 341, 377
Dentaria, 144, 199, 211, 349
Deringa, 144, 201, 217, 355
Deschampsia, 144, 204
Description of a new Stonecrop from Mexico, 257
of the Museum Building, 167
of the Range of the Horticultural Houses with plates, 164
of new North American Thorns, 447
Desmanthus, 144
Deutzia, 144, 226, 232, 365, 374
Diacrium, 380
Dianthus, 145, 209, 347, 393
Dichelyma, 392
Dicksonia, 145, 195, 236
Dicotyledones, 208
Dicranella, 195, 392
Dicranum, 195, 392
Dictamnus, 145, 215, 353
Didiscus, 355
Dieffenbachia, 237, 378
Diervilla, 145, 228, 235, 368, 376
Dietes, 379
Digitalis, 145, 220, 359
Dimeria, 204
Dimorphanthus, 145, 227
Dimorphotheca, 145, 224, 363
Dionaea, 381
Dioscorea, 198, 371
Diospyros, 145, 235, 376
Diphylleia, 349
Diplachne, 292
Diplotaxis, 145
Dipsacus, 145, 221, 360
Dirca, 145, 227, 367
Director-in-Chief, Provisional Regulations for the Office of, 52
Report of Secretary and, 106, 122, 171, 295
Director of the Laboratories, Report of, 331
Directors, Scientific, Report of, 414
Disporum, 345
Ditrichum, 195, 392
Diversion of the Bronx River from its old Channel, 78
Dodecatheon, 145, 218, 356
Dolichos, 145, 213, 381
Dondia, 280
Doodia, 236, 377
Doryanthes, 237, 379
Dorycnium, 145
Draba, 145, 199, 211, 349
Dracaena, 145, 378
Dracocephalum, 145, 219, 357
Drainage, 45, 109, 177, 300
Driveways, 27
Drosera, 350
Dryas, 212, 350
Drymocallis, 350
Dryopteris, 145, 195, 203, 236, 341, 377, 393
Duchesnea, 350, 381
Dugaldea, 363

Eatonia, 145, 196
Echeveria, 145, 238, 381
Echinais, 224
Echinocactus, 145, 217, 240, 354, 383
Echinocereus, 217
Echinops, 145, 224, 363
Echinopsis, 145, 240, 383
Echium, 145, 219
Eclipta, 145
Economic Collections, Report of the Honorary Curator of, 252, 322
Economic Garden, 41
Elatinoides, 359
Elaeagnus, 145, 227, 235, 367, 376
Elephantella, 359
Eleocharis, 145, 197, 206, 343
Elettaria, 237, 379
Eleusine, 145
Elsholtzia, 357
Elymus, 145, 196, 204, 342
Emex, 346
Emilia, 363
Employed Persons, and their Work, 183
Encelia, 146
Endowment Fund, 11
Entelea, 382
Entodon, 393
Entrances, 25
Ephemerum, 392
Epidendron, 146, 238, 380
Epigaea, 146, 201
Epilobium, 146, 201, 217, 355
Epipactis, 146, 207
Epiphegus, 146
Epiphyllum, 146, 240, 383
Equisetum, 146, 196, 204, 341
Eragrostis, 146, 196, 204
Eranthemum, 385
Eranthis, 210, 348
Erechtites, 146, 203
Erianthus, 146, 204, 342, 429
Erigeron, 146, 203, 224, 363
Erinus, 146, 220
Eriogonum, 146, 208, 346
Erodium, 146, 215, 352
Ervilia, 351
Ervum, 351
Eryngium, 146, 217, 355

Erysimum, 211, 349
Erythrina, 239, 381
Erythronium, 146, 197, 206
Erythroxylon, 381
Eschscholtzia, 146, 211, 349
Eucalyptus, 384
Eucharidia, 146
Eucharis, 146, 237, 379
Euclidium, 211, 349
Eugenia, 146, 241, 384
Euonymus, 146, 200, 227, 234, 367, 375
Eupatorium, 146, 203, 224, 242, 363, 385
Euphorbia, 146, 200, 215, 239, 353, 381
Eurhynchium, 393
Eurya, 382
Euthamia, 146, 203, 224, 363
Evolvulus, 218, 285
Exchanges, List of, 185, 326
Exacum, 384
Exochorda, 146, 226, 233, 365, 374
Expenditures during 1897 under Appropriations made by the Board, Schedule of, 134
Schedule of, during 1898 under Appropriations made by the Board, 193
under Appropriations made by the Board of Managers, 134
Exploration, Botanical, of Porto Rico, 182, 309

Fagopyrum, 146, 208, 346
Fagus, 146, 198, 229, 231, 369
Falcata, 146, 200, 213, 352
Families, List of, under cultivation, 386, 387, 388, 389, 390
Farsetia, 211, 349
Fedia, 146, 360, 385
Fellows and Members, Report of Committee on Patrons, 98, 243, 401
Fellows, Annual Members and, 112
Fellows for Life, Provisions for Patrons . . . and Annual Members, 7
Ferula, 146
Festuca, 146, 196, 204, 342
Ficaria, 147
Ficus, 147, 238, 380
Filifera, 147
Fimbristylis, 343
Financial Statement, Condensed, 162
Fissidens, 195, 392
Fittonia, 242, 385
Flora, Wild, 195, 340
Foeniculum, 147, 217, 355
Forest Areas, 42
Forsythia, 147, 228, 235, 368
Fourcroya, 147, 237
Fragaria, 147, 199, 212, 350
Frasera, 218, 356
Fraxinus, 147, 201, 230, 235, 371, 376
Froelichia, 147, 347
Frullania, 195
Fruticetum, 36, 226, 337, 364
List of Families in, 387
Fuchsia, 147, 241, 384
Funkia, 147, 206, 344
Funaria, 195
Furcraea, 379
Fusidium, 425

Gaillardia, 147, 224, 363
Galactia, 147, 239
Galanthus, 147
Galax, 356
Galega, 147, 213, 352
Galeopsis, 219, 357
Galinsoga, 147, 224, 363
Galium, 147, 202, 221, 360
Galtonia, 344
Garden, Bog, 38
Botanical, List of Plants in the Grounds of the New York . . ., and in the Temporary Greenhouse, 137
Plan of the New York, 86
Economic, 41
Gardener, Head, Report of, 334
Gardens, Botanical, 62
Gas, Illuminating, 46
Gasteria, 147, 237
Gaudinia, 147, 342
Gaultheria, 147, 201, 218, 356
Gaura, 147, 217, 355
Gaylussacia, 235, 376
Gelsemium, 147, 384
Gemmingia, 147, 207, 345
General Considerations, 24
Plan for Arrangement of Museums, 50
Genista, 147, 213, 227, 234, 352, 366, 375
Gentiana, 147, 201, 218, 356
Georgia, 392
Geranium, 147, 200, 215, 353, 393
Gerardia, 147, 202
Gerbera, 224, 363
Geum, 147, 199, 212, 350
Gilia, 147, 218, 356
Ginkgo, 147, 228, 369
Gladiolus, 345
Glaucium, 148, 211, 349
Glechoma, 148, 201, 219, 357
Gleditsia, 148, 200, 229, 234, 370, 375
Globba, 379
Globularia, 359
Glycine, 148, 213, 352
Glycyrrhiza, 213, 352
Godetia, 355
Grading, 44, 109, 124, 178, 303
Grasses, new, from the Southern States, 429
New Southern, 290
Gratiola, 202
Greenhouse, 339
Temporary, 110, 125, 236
List of Families in, 389
Grevillea, 380
Grimmia, 392
Grindelia, 148, 224
Grounds, Allotment of, 49
Care of, 110, 125, 180, 305
Decorative, 34
Herbaceous, 37
Lists of Plants in, 1898, 195
Guizotia, 148, 224, 363
Gutierrezia, 224
Gymnocladus, 148, 234, 375
Gypsophila, 148, 209, 347
Gyrostachys, 148, 198, 207

Habenaria, 148, 198, 207, 346
Hablitzia, 208
Haloragis, 355
Hamamelis, 148, 199, 226, 365
Haplocarpa, 363
Hartmannia, 355
Haworthia, 148, 237, 378
Hebenstreitia, 148, 220, 359
Hedeoma, 148, 201
Hedera, 384
Hedwigia, 195
Hedychium, 148, 237
Hedypnois, 148, 222, 361
Hedysarum, 148, 213, 239, 352
Heeria, 241
Helenium, 148, 224, 363
Helianthella, 224, 363
Helianthemum, 148, 200, 216, 235, 354
Helianthus, 148, 203, 224, 363
Helichrysum, 148, 363
Heliopsis, 148, 224, 363
Heliotropium, 357, 385
Helleborus, 148, 210, 348
Helonias, 344
Hemerocallis, 148, 198, 206, 344
Hepatica, 148, 199, 348
Herbaceous Collection, List of Families in, 386
Heracleum, 148, 217, 355
Herbaceous Collection, 203
Grounds, 37, 337, 341
Herbarium, Museums and, 112, 126, 181, 307, 316, 317, 340
of J. B. Ellis, 20.
Herniaria, 148
Hesperis, 148, 211, 349
Heteranthera, 344
Heterocentron, 384
Heterotheca, 148
Heuchera, 148, 199, 212, 350
Hibiscus, 148, 200, 216, 227, 239, 354, 367, 382
Hicoria, 148, 198, 228, 231, 369, 373, 393
Hieracium, 148, 202, 222, 361, 393
Hippeastrum, 207
Hippocrepis, 148
Hippophoë, 235, 367
Holcus, 148, 196, 205, 342
Holodiscus, 233, 374
Homalanthus, 382
Homalocenchrus, 148, 196, 342
Hordeum, 205, 342
Horticultural Houses, Contract for Construction of, 175
Description of the Range of, with plates, 164
Surroundings of the Range of, 305
Houstonia, 148, 221, 289, 360
Hoxenia, 148, 234, 376
Hoxiea, 378
Hoya, 385
Humulus, 231, 373
Hyacinthus, 206, 344
Hydrangea, 149, 226, 232, 365, 374, 381
Hydrastis, 149, 210, 348
Hydrocleys, 342, 377
Hydrocotyle, 149, 201, 217, 355
Hydrolea, 385
Hydrophyllum, 149, 219, 356
Hymenocallis, 207, 345
Hymenopappus, 224
Hyoscyamus, 220, 358
Hyoseris, 222, 361
Hypecoum, 349
Hypericum, 149, 200, 216, 227, 282, 354, 367
Hypnum, 195, 393
Hypochoeris, 222, 361
Hypopitys, 420
Hypoxis, 149, 198, 345
Hyssopus, 149, 219, 357
Hystrix, 149, 196, 205

Iberis, 149, 211, 349
Ilex, 149, 200, 237, 230, 367, 370, 375
Illuminating Gas, 46
Impatiens, 149, 200, 216, 353
Incorporation, Act of, 1
Amendment to the Act of, 54
Indigofera, 213, 381
Insurance, 182
Inula, 149, 224, 363
Ipomoea, 149, 218, 356, 371, 376, 385
Iris, 149, 198, 207, 345
Isatis, 149, 211, 349
Ismene, 345
Isomeris, 211
Isotria, 346
Itea, 149, 226, 365
Iva, 149, 290, 361

Jasione, 149, 222
Jasminum, 384
Jeffersonia, 149, 210, 349
Jerome Park Reservoir, Temporary Railway for the Construction of, 111, 125
Juglans, 149, 198, 228, 369
Juncoides, 149, 197, 206, 344
Juncus, 149, 197, 206, 344
Juniperus, 149, 196, 228, 230, 369, 372
Jurinea, 149, 225
Jussiaea, 149, 384
Justicia, 149, 221, 359, 385

Kalanchoë, 381
Kalmia, 149, 201, 235, 368, 376
Kennedya, 381
Kentia, 149, 236
Kentrophyllum, 225
Kernera, 349
Kerria, 233, 374
Kitaibelia, 216, 354
Kleinia, 149, 242, 385
Knautia, 221, 360
Kneiffia, 149, 201, 217, 355
Kniphofia, 344
Koellia, 149, 201, 219, 357
Koeleria, 149, 342
Koelreuteria, 149, 234, 376
Koniga, 149, 211
Kostelelzkya, 149
Krauuhia, 234, 371, 381
Krubera, 235, 376
Krynitzkia, 219
Kuhnia, 225, 363
Kuhnistera, 149, 213, 352
Kunzia, 351

Kyllinga, 378

Labels, 17, 315, 339
Laboratories, 308
    Report of Director of, 331
Laburnum, 234, 375
Lacinaria, 149, 225, 363
Lactuca, 149, 202, 222, 361
Laelia, 149, 238, 380
Lagenera, 385
Lagerstroemia, 149, 241, 384
Lakes and Ponds, 39
Lallemantia, 357
Lamium, 219, 357
Lapsana, 225, 361
Larix, 149, 196, 228, 230, 369, 372
Laserpitium, 217, 355
Lasiagrostis, 342
Latania, 149, 236, 378
Lathyrus, 150, 200, 214, 352, 371
Lavatera, 150, 216, 354
Lavauxia, 217, 355
Lechea, 150, 200, 216, 354
Lectures, 17, 21, 112, 126, 181, 308
Ledum, 368
Legouzia, 150
Leicesteria, 368
Lejeunea, 195
Lemna, 150, 197
Lens, 150
Leontodon, 150, 202, 222, 361
Leontopodium, 225, 363
Leonurus, 150, 201, 219, 357
Lepargyraea, 235, 367, 376
Lepidium, 150, 199, 211, 349
Leptadenia, 218
Leptamnium, 202
Leptandra, 150, 220, 359
Leptobryum, 195
Leptorchis, 150, 208, 346
Leptosyne, 150
Leskea, 195
Lespedeza, 150, 200, 214, 227, 352, 366
Leucobryum, 195, 392
Leucocrinum, 206, 344
Leucojum, 150
Leucothoë, 150, 228, 235, 284, 368, 376
Levisticum, 355
Leycesteria, 235
Librarian, Report of the Acting, 325
Library, 112, 126, 181, 306
Ligusticum, 150, 217, 228, 355
Ligustrum, 368
Lilium, 150, 198, 206, 344
Limnanthes, 216
Limodorum, 208
Limonium, 150, 218, 356
Linaria, 150, 202, 220, 359
Lindelofia, 150, 219, 357
Lindheimeria, 225
Linnaea, 235
Linum, 150, 200, 215, 353
Lippia, 219, 357
Liquidambar, 150, 199, 229, 370
Liriodendron, 150, 199, 229, 369
List of Exchanges, 185, 326
    Of Families in the Arboretum (including Pinetum), 387
    Of Families in the Fruticetum, 387
    List of Families in the Herbaceous collection, 386
    Of Families in the Nurseries and Borders, 388
    Of Families in the Temporary Greenhouse, 389
    Of Families in Viticetum, 388
    Of Families under Cultivation in the various Plantations, 390
    Of Plants in the Grounds, 1898, 195
Lothospermum, 150, 219, 357
Lobelia, 150, 202, 360, 393
Lolium, 150, 196, 205, 342
Lomaria, 341
Lonas, 150, 225
Lonicera, 150, 228, 235, 368, 371, 376
Lopezia, 363
Lotus, 150, 214, 352
Lubinia, 356
Luculia, 385
Ludwigia, 151, 217, 355
Luffa, 385
Lunaria, 151, 211, 349
Lupinus, 151, 214, 352
Lycaste, 151, 238, 380
Lychnis, 151, 209, 347
Lycium, 151, 371
Lycopodium, 204, 341
Lycopsis, 357
Lycopus, 151, 201, 219, 357
Lygeum, 151, 205
Lygodesmia, 225
Lygodium, 236, 341, 377
Lysimachia, 151, 201, 218, 356
Lythrum, 217, 354

Madia, 151, 225
Magnolia, 151, 229, 232, 370, 374
Mahernia, 239, 382
Malope, 151, 216
Malus, 151, 200, 229, 233, 370
Malva, 151, 200, 216, 354
Malvastrum, 151, 216, 354
Malvaviscus, 382
Mammillaria, 151, 240, 383
Managers, Board of, Expenditures under Appropriations made by the, 116
Mandevilla, 241, 384
Manisuris, 430
Map of New York Zoological Park and Botanical Garden, 170
    of Site Appropriated for New York Botanical Garden, 22
Maranta, 151, 237, 379
Map of the Lower Bronx River, 81
Mariana, 151
Marrubium, 219, 357
Martinezia, 378
Martynia, 151, 221, 359
Marula, 225
Material, Accessions of, 113, 127, 185, 393
Matricaria, 151, 225, 363
Matthiola, 151
Maurandia, 385
Meadows, 42
Medeola, 151, 198, 207, 345
Medicago, 151, 200, 214, 352
Megapterium, 151, 355

Meibomia, 151, 200, 214, 352, 381
Melaleuca, 384
Melampyrum, 151, 202, 220
Melanthium, 206, 344
Melasphaerula, 379
Melia, 151
Melica, 205
Melilotus, 151, 200, 214, 352
Melissa, 151, 219, 357
Melochia, 382
Members, Annual, 5, 7, 56, 98, 112, 243, 401
Menispermum, 232, 371
Mentha, 151, 219, 357
Mentzelia, 217, 354, 368
Mercurialis, 151, 216, 353
Meriolix, 217
Mertensia, 151, 219, 357
Mesadenia, 225, 363
Mesembryanthemum, 151, 238, 347, 381
Meteorological Observations, 310
Meteuccia, 341
Mexico, Description of a new Stonecrop from, 257
Microseris, 225
Milla, 207
Mimosa, 381
Mimulus, 151, 202, 220, 359
Miltonia, 151, 238, 380
Mirabilis, 151, 209, 347
Miscanthus, 151, 205, 342
Mitchella, 151, 202, 221, 360
Mitella, 350
Mnium, 195, 392
Mohrodendron, 152, 230, 235, 370
Mollugo, 152, 199, 209, 347
Moluccella, 152, 357
Momordica, 385
Monarda, 152, 219, 357, 385
Monocotyledones, 204, 342
Monolepis, 152
Monotropa, 152, 419
Monotropaceae, The Roots and Mycorhizas of some of the (with plates), 419
Monstera, 378
Montana, Botany of, 182
Montbretia, 207
Morus, 152, 198, 226, 229, 231, 365, 369, 373
Mosla, 358
Mounting of Specimens, 316
Muhlenbeckia, 381
Muhlenbergia, 152, 196, 205, 342
Murraya, 239, 381
Musa, 152, 237, 379
Museum Building, Description of, 167
Report of the Curator of, 311
Museums, 50, 112, 126, 167, 181, 307, 311, 317
and Herbarium, 112, 126, 181, 307, 317
General Plan for Arrangement of, 50
Musineon, 217, 355
Mycorhizas, of some of the Monotropaceae, Roots and, (with plates), 419
Myosotis, 152, 201, 219, 357
Myrica, 152, 198, 226, 364
Myrsiphyllum, 378
Myrtus, 384

Nabalus, 152, 202, 222, 361
Narcissus, 230, 372
Nazia, 342
Nelumbo, 232, 373
Nemesia, 152
Nemophila, 356
Neowashingtonia, 236, 378
Nepeta, 152, 201, 219, 358
Nephrolepis, 152, 236, 377
Nerium, 384
Neslia, 349
Neviusia, 226, 365
New Southern Grasses, 290
Nicandra, 358
Nicotiana, 152, 220, 358
Nidularium, 237, 378
Nierembergia, 152, 358
Nigella, 152, 210
Nolana, 152, 358
North American Thorns, Descriptions of new, 447
Notholaena, 203
Nothoscordon, 345
Notobasis, 225
Notothylas, 195
Nurseries and Borders, 42, 230, 339, 372, 388
Nurseries, Permanent, 42
Nymphaea, 152, 199
Nyssa, 152, 201, 230, 370

Observations, Meteorological, 310
Ocimum, 358
Odontoschisma, 195
Oenanthe, 152, 218, 355
Oenothera, 152, 217, 355
Office, Temporary, 309
Omphalodes, 152, 219, 357
Onagra, 152, 201, 217, 355
Oncidium, 152, 238, 380
Onobrychis, 152, 214
Onoclea, 152, 196, 203, 341
Ononis, 152, 214, 352
Onopordon, 152, 225, 363
Onosmodium, 219
Ophioglossum, 152, 203, 341
Ophrys, 152
Oplismenus, 378
Opulaster, 152, 226, 233, 365, 374
Opuntia, 152, 201, 217, 240, 354, 383
Orchis, 153, 208, 346
Origanum, 153, 201, 219, 358
Orlaya, 218
Ornithogalum, 153, 198, 207, 345
Ornithopus, 352
Orontium, 343
Orthotrichum, 195, 392
Oryza, 342
Oryzopsis, 153
Orobus, 153
Osmunda, 153, 195, 203, 341
Ostrya, 153, 229, 231, 369
Oxalis, 153, 200, 215, 234, 239, 353, 381 393
Oxycoccus, 368
Oxydendron, 153, 235, 376
Oxytropis, 352

Pachylophus, 217, 355
Pachysandra, 234, 375
Paeonia, 153, 210, 226, 232, 348, 365, 373
Paliurus, 227, 367
Panax, 153, 201, 217, 235, 241, 355, 376
Pancratium, 207, 345
Pandanus, 377
Panicum, 153, 196, 205, 236, 342, 378, 393
Panicularia, 153, 196, 205, 342
Papaver, 153, 211, 349
Paradisea, 207, 345
Parietaria, 153, 346
Paris, 153
Park Department, Work of, on the Roads, 183
Reservoir, Temporary Railway for the Construction of the Jerome, 111, 125
Sewer, Williamsbridge and Bronx, 110, 125
Parnassia, 153, 212
Paronychia, 348
Parosela, 153
Parsonsia, 153, 354
Parthenium, 153, 225, 363
Parthenocissus, 153, 200, 234, 371, 376
Paspalum, 153, 197, 205, 290, 434
Passiflora, 153, 239, 283, 371, 382
Pastinaca, 201, 218, 355
Paths, 30, 304
Patrons, Fellows and Annual Members, Report of Committee on, 98, 243, 401
List of, 8
Provisions for, Fellows for life and Annual Members, 7, 8, 98, 343, 401
Paulownia, 153, 230, 235, 371
Pavonia, 239, 354, 382
Pedicularis, 153, 202, 220
Pegamum, 355
Pelargonium, 153, 239, 353, 381
Pellaea, 153, 203, 236, 341, 377
Peltandra, 153, 197, 206
Peltaphyllum, 212, 350
Peltaria, 349
Pennisetum, 343
Penthorum, 153, 199
Pentstemon, 153, 220, 359
Peperomia, 380
Peramium, 154, 208
Pereskia, 154, 241, 384
Periploca, 371
Peristrophe, 385
Permanent Nurseries, 45
Persons Employed and their Work, 183
Petasites, 154, 225, 363
Petiveria, 381
Petunia, 154
Peucedanum, 154, 218, 355
Phaca, 352
Phacelia, 154, 356
Phaedranassa, 207, 345
Phajus, 154, 237, 380
Phalaenopsis, 154, 380
Phalaris, 134, 197, 205, 343
Phaseolus, 154, 214, 352
Phegopteris, 154, 196, 203, 341
Phellodendron, 154, 229, 370
Philadelphus, 154, 226, 365, 374
Phleum, 154, 197, 205, 343
Philotria, 342
Phlomis, 154, 220, 358
Phlox, 154, 218, 356
Phoenix, 154, 236, 378
Photinia, 154, 229
Phragmites, 205, 343
Phryma, 154, 202
Phyllanthus, 382
Phyllitis, 203
Phyllocactus, 154, 241, 384
Physalis, 154, 202, 220, 356
Physaria, 154, 211
Physostegia, 219, 358
Phyteuma, 222, 360
Phytolacca, 154, 199, 209, 347
Piaropus, 154, 237, 344, 378
Picea, 196, 230, 236, 372, 393
Picridium, 322
Picris, 154, 222, 225, 361
Pieris, 368
Pilea, 380
Pilocereus, 154, 241, 384
Pilicaria, 156, 363
Pilumna, 380
Pimpinella, 154, 218, 355
Pinetum, 34
Pinus, 154, 196, 228, 230, 236, 369, 372, 377
Pisum, 154, 214, 375
Plagiothecium, 195, 393
Plan of the New York Botanical Garden, 86
Planera, 154, 226, 365
Plans, 23 47, 87, 106,
Commission, Report of, 23, 47, 87, 106
Report of Committee on, 47, 87
Plantago, 154, 202, 221, 288, 359, 393
Platanus, 154, 199, 229, 233, 370
Plantations, Care of, 108, 390
List of Families under Cultivation in the, 390
Planting, 108, 122
Plants and Planting, 171, 295
Plants in the Grounds, Lists of, 137, 195
Platycerium, 154, 236, 377
Platyclinis, 380
Platycodon, 154, 222, 360
Plectranthus, 220, 358
Pleione, 154, 238, 380
Pleroma, 241, 384
Pleuridium, 392
Plumbago, 154, 218, 356, 384
Poa, 154, 197, 205, 343
Podolepis, 155
Podophyllum, 155, 210, 349
Polanisia, 211, 350
Polemonium, 155, 219, 356
Polycarpaea, 348
Polygala, 155, 200, 215
Polygonatum, 155, 198, 207, 345
Polygonum, 155, 198, 208, 346, 371
Polymnia, 155, 225, 363
Polypodium, 155, 196, 203, 236, 377
Polypogon, 155
Polystichum, 155, 377
Polytrichum, 195

Ponds, Lakes and, 39
Pontederia, 155, 197
Populus, 155, 198, 228, 231, 369, 372
Porteranthus, 155, 212, 351
Porto Rico, Botanical Exploration of, 182, 309
Portulaca, 199, 347
Potentilla, 155, 199, 212, 351
Pottia 392
Pourthiaea, 370
Power House, 175, 299
Preparation of Plans, 106
Primula, 155, 218, 241, 384
Propagating House, 300
Provisions for Patrons, Fellows for life and Annual Members, 7
Prunella, 155, 201, 220, 358
Prunus, 155, 200, 227, 229, 233, 366, 370, 375
Pseudotsuga, 155, 230, 236, 377
Psidium, 155, 241, 384
Psoralea, 155, 214, 352
Ptelea, 155, 227, 367
Pteridophyta, 195, 203, 341, 377, 393
Pteris, 155, 203, 236, 377
Pterospora, 420
Pterostyrax, 156 228, 368
Ptychomitrium, 195
Public Comfort Station, 175, 299
Publications, 308
Pulsatilla, 156, 210, 348
Punica, 156, 241
Purshia, 213
Pyrola, 156, 201, 218, 356
Pyrethrum, 156
Pyrus, 156, 200, 227, 229, 233, 366, 370, 375

Quamasia, 345
Quercus, 156, 198, 226, 229, 231, 365, 369, 373, 380

Railway, Temporary, for the Construction of Jerome Park Reservoir, 111, 125
Range of the Horticultural Houses, Description of, with illustration, 164
Ranunculus, 156, 199, 210, 348, 393
Raphidostegium, 195
Rapistrum, 211
Ratibida, 156, 225, 363
Recent Progress, 20
Registration and Admission of Students, Regulations for, 418
Regulations for the Admission and Registration of Students, 418
Provisional, for the Office of the Director-in-Chief, 52
Report of Committee on Patrons, Fellows and Annual Members, 98, 243, 401
of Committee on Plans, 47, 87
of the Acting Librarian, 325
of the Curator of the Museums, 311
of the Director of the Laboratories, 331
of the General Assistant, 337
of the Head Gardener, 334
Report of the Honorary Curator of Economic Collections, 252, 322
of the Plans Commission, 23
of the Scientific Directors, 414
of the Secretary and Director-in-Chief, 106, 122, 171, 295
of the Secretary, for 1895, 10
of the Treasurer, 18, 412
Research, An Outline of Subjects Offered by . . . New York Botanical Garden and . . . Dept. of Botany, Columbia University, 416
Reseda, 156, 212, 350
Reserve Areas, 46
Reservoir, Temporary Railway for the Construction of the Jerome Park, 111, 125
Rhagadiolus, 361
Rhamnus, 156, 200, 227, 234, 367, 376
Rhapis, 378
Rheum, 156, 208, 346
Rhexia, 156
Rhipsalis, 156, 241, 384
Rhododendron, 156, 235, 368, 376
Rhodora, 156, 368
Rhodotypos, 156, 226, 366
Rhus, 156, 200, 227, 230, 234, 367, 370, 375
Rhynchosia, 156, 215, 239
Rhynchostegium, 393
Ribes, 156, 226, 232, 365, 374
Riccia, 195
Richardsonia, 156, 360
Ricinus, 156, 216
Rivina, 381
Roads and Paths, 183, 304
Robinia, 156, 200, 227, 229, 234, 366, 370, 375, 381
Rochea, 156, 239, 381
Rockery, 38
Rodigia, 222
Rondeletia, 242, 385
Roots and Mycorhizas of some of the Monotropaceae (with plates), 419
Roripa, 156, 199, 211, 349
Rosa, 156, 199, 226, 233, 366, 371, 374
Rubia, 221, 360
Rubus, 157, 199, 213, 226, 233, 351, 366, 374
Rudbeckia, 157, 225, 364
Ruellia, 157, 221, 359, 385
Rumex, 157, 198, 208, 346, 381, 393
Russelia, 242, 385
Ruta, 157, 215, 353

Sabal, 157, 236, 378
Sabbatia, 157
Sagittaria, 196
Saintpaulia, 242, 385
Salix, 157, 198, 226, 228, 231, 257, 364, 369, 372
Salsola, 157
Salvia, 157, 220, 358, 385
Sambucus, 157, 202, 236, 376
Sanguinaria, 157, 211, 349
Sanguisorba, 157, 213, 351
Sanicula, 157, 201, 218
Sansevieria, 157, 237, 378
Santivalia, 364
Santolina, 157, 225, 364

Sapindus, 157, 227, 367
Sapium, 382
Saponaria, 157, 199, 209
Saracha, 157, 220, 358
Sarcodes, 420
Sarothra, 157, 200, 216, 354
Sarracenia, 350
Sassafras, 157, 199, 229, 370
Sauromatum, 206, 343
Saururus, 157, 198, 346
Saussurea, 364
Savastana, 157, 205, 343
Saxifraga, 157, 199, 212, 350, 381
Scabiosa, 157, 221, 360
Scandix, 157, 218, 355
Schedule of Expenditures under Appropriations made by the Board, 134, 193, 397
Schismatoglottis, 237, 378
Schizanthus, 157
Scientific Directors, Report of, 414
Resolutions of, 14
for 1895, Report of, 10
Scilla, 345
Scirpus, 158, 197, 206, 343, 378
Scleranthus, 158, 199, 209, 348
Sclerocarpus, 158
Scolopendrium, 158
Scolymus, 225, 364
Scorpiurus, 158, 215, 352
Scorzonera, 225, 364
Scrophularia, 158, 202, 221, 359
Scutellaria, 158, 202, 220, 358
Secale, 158, 205, 343
Secretary and Director-in-Chief Report of, 106, 122, 171, 295
Securigera, 158, 215, 352
Sedum, 158, 212, 239, 257, 350, 381
Selaginella, 158, 196, 204, 236, 341, 377
Selinum, 218
Sempervivum, 158, 212, 350
Senecio, 158, 225, 242, 364, 385
Sepedonium, 425
Sepularia, 202
Serratula, 158, 225, 364
Sesamum, 158, 235
Seseli, 158, 218, 355
Sesleria, 205, 343
Sewage Disposal, 44
Sewer, Williamsbridge and Bronx Park, 110, 125
Sewerage, 300
Sherardia, 158, 221, 360
Shortia, 356
Sibaldiopsis, 213, 351
Sicyos, 158, 202
Sida, 158, 216, 239, 354
Sidalcea, 158, 216, 354
Sideritis, 220, 358
Siegesbeckia, 225
Sieglingia, 158
Sieversia, 351
Silene, 158, 199, 209, 348
Silphium, 158, 225, 364
Sinapis, 211
Sisymbrium, 158, 211, 349
Sisyrinchium, 158, 198, 207, 345, 379
Sitilias, 158, 222
Smilax, 158, 198, 345, 371
Solanum, 158, 202, 242, 358, 371, 385
Solidago, 158, 225, 242, 364
Some new Grasses from the Southern States, 429
Sonerila, 384
Sophora, 159, 212, 227, 367
Sorbaria, 366
Sorbus, 159, 229, 233, 370
Sorghum, 159, 205, 343
Southern Grasses, New, 290
Sparganium, 159, 196, 341
Spartina, 159, 205, 343
Spartium, 215, 366
Spathyema, 159, 197, 206, 343
Specimen Trees, 33
Spermatophyta, 196, 204, 342, 377, 393
Sphenogyne, 225
Spiesia, 215
Spilanthes, 364
Spiraea, 159, 226, 233, 351, 366, 375
Sporobolus, 159, 197, 205
Sprekelia, 207
Stable, 33, 175, 299
Stachys, 159, 220, 358
Stanleya, 211
Stapelia, 159, 241, 385
Staphylea, 159, 200, 227, 367
Statement, Condensed Financial, 162
Statice, 159, 218, 356
Steironema, 159, 201, 218
Stenanthium, 344
Stephanandra, 159, 227, 366
Stevia, 159, 242, 385
Stipa, 159
Stokesia, 159, 225, 364
Stonecrop, new, from Mexico, Description of, 257
Strelitzia, 159, 237, 379
Streptocarpus, 242
Streptopus, 207, 345
Strobilanthes, 385
Strophostyles, 159, 215
Struthiopteris, 159
Stuartia, 227, 367
Students, Regulations for the Admismission and Registration of, 418
Stylophorum, 159, 211
Styrax, 159, 368
Subsoil Drainage, 45
Subway, Power House to Museum, 175, 299
Succisa, 222, 360
Surface Drainage, 45
Surroundings of the Range of Horticultural Houses, 305
Sutherlandia, 381
Swertia, 159, 218, 356
Symphoricarpos, 159, 228, 236, 368
Symphytum, 219, 357
Syndesmon, 159, 199, 210, 348
Synosma, 225, 364
Syntherisma, 159, 197, 205, 343
Syringa, 159, 201, 228, 235, 368, 376

Tagetes, 159, 225, 364
Talinum, 347
Tamarix, 159, 227, 367
Tanacetum, 159, 225, 364
Taraxacum, 159, 202, 222, 361

Taxodium, 159, 230, 369
Taxus, 159, 228, 369
Tecoma, 159, 202, 235, 376
Temporary Greenhouse, 110, 125, 236, 377, 389
Office, 309
Railway for the Construction of the Jerome Park Reservoir, 111, 125
Tetragonia, 159, 209, 347
Tetragonolobus, 215
Teucrium, 159, 220, 288, 358
Thalesia, 160, 202
Thalia, 237, 346, 379
Thalictrum, 160, 199, 210, 348
Thaspium, 355
Thelesperma, 160, 225
Thelia, 392
Themeda, 205, 343
Thermopsis, 160, 215, 352
Therofon, 350
Thorns, Descriptions of New North American, 447
Thlaspi, 211
Thuidium, 195, 392
Thuja, 236, 377
Thyrsacanthus, 385
Tiarella, 160, 212
Tilia, 160, 230, 234, 370, 376
Tillandsia, 160, 237, 378
Tinantia, 160, 206, 344
Tipularia, 208, 346
Tiarella, 350
Tolpis, 160, 222, 361
Tool House, 175, 299
Tordylium, 355
Torenia, 385
Tortula, 392
Townsendia, 225
Toxicophlaea, 241, 385
Toxylon, 160, 229, 369
Trachelium, 385
Trachelospermum, 241, 385
Trachycarpus, 378
Trachymene, 160
Tradescantia, 160, 206, 344
Tragopogon, 225, 361
Treasurer, Report of, 18, 412
Trees, Specimen, 33
Trichosanthes, 160, 377
Trichostema, 160, 202
Trichosma, 160, 238
Tricuspis, 197, 205, 293, 343
Tricyrtis, 207, 344
Tridax, 160, 364
Trifolium, 160, 200, 215, 352
Trigonella, 160, 215
Trillium, 160, 198, 207, 345
Trinia, 160
Triosteum, 160, 221, 360
Tripsacum, 160, 205, 343
Trisetum, new, from Michigan, 437
Triticum, 160, 205, 343
Tritonia, 345
Tritoma, 207
Trollius, 160, 210, 349
Tropaeolum, 160, 215, 353
Tsuga, 160, 196, 228, 369, 377
Tubercinia, 425
Tunica, 160, 210
Tussilago, 160, 225, 364
Typha, 160, 196

Ulex, 234, 367
Ulmaria, 160, 213, 351
Ulmus, 160, 198, 229, 231, 369, 373
Undescribed Species from the Southern United States, 278
Unifolium, 160, 198, 207, 345
Uniola, 343
Uropappus, 160
Urospermum, 160, 225, 361
Ursinia, 160, 364
Urtica, 160, 208, 346
Urticastrum, 160, 198, 208, 346, 359
Uvularia, 160, 197, 206, 344

Vaccinium, 160, 201, 228, 235, 368, 376
Vagnera, 160, 198, 207, 345
Valeriana, 160, 221, 360
Valerianella, 360
Vancouveria, 160, 210, 349
Vanilla, 380
Veltheimia, 378
Veratrum, 160, 197, 206, 344
Verbascum, 160, 221, 359
Verbena, 160, 201, 219, 242, 357, 393
Verbesina, 161, 225, 364
Vernonia, 161, 225, 364
Veronica, 161, 202, 221, 242, 359, 385
Viburnum, 166, 202, 228, 230, 236, 368, 371, 377
Vicia, 161, 200, 215, 352, 375
Vigna, 215, 375
Vinca, 161, 201, 356, 385
Vincetoxicum, 161, 218, 356
Viola, 161, 200, 216, 354
Viscaria, 161, 210
Vitex, 161, 235, 368
Viticetum, 37, 338
Vitis, 200, 371
Vitus, 234

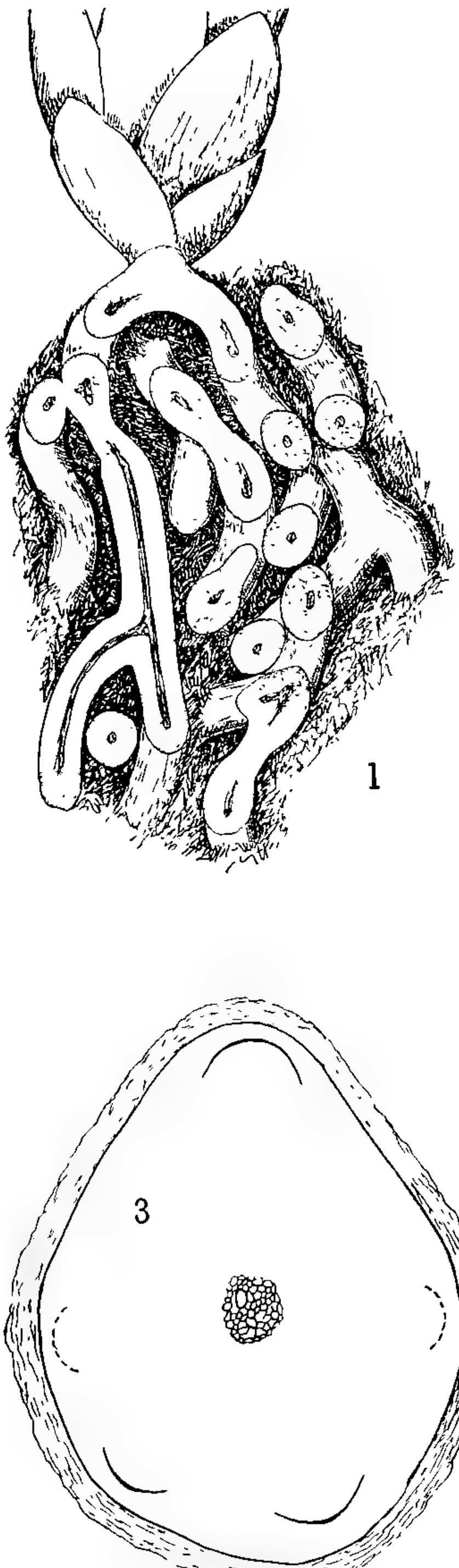
Waldsteinia, 161, 213, 351
Washingtonia, 161, 201, 218
Water Supply, 43, 93, 179, 302
Webera, 195
Weigela, 161, 236, 368, 377
Weingaertneria, 343
Weissia, 195, 392
Wiegandia, 358
Wild Flora, 195, 340, 392
Williamsbridge and Bronx Park Sewer, 110, 125
Willows, Cespitose, of Arctic America and the Rocky Mountains, 257
Willughbaeya, 161
Wistaria, 161
Woodsia, 203, 341
Woodwardia, 161, 204, 236, 377
Work of the Park Department on the Roads, 183
Wulfenia, 161

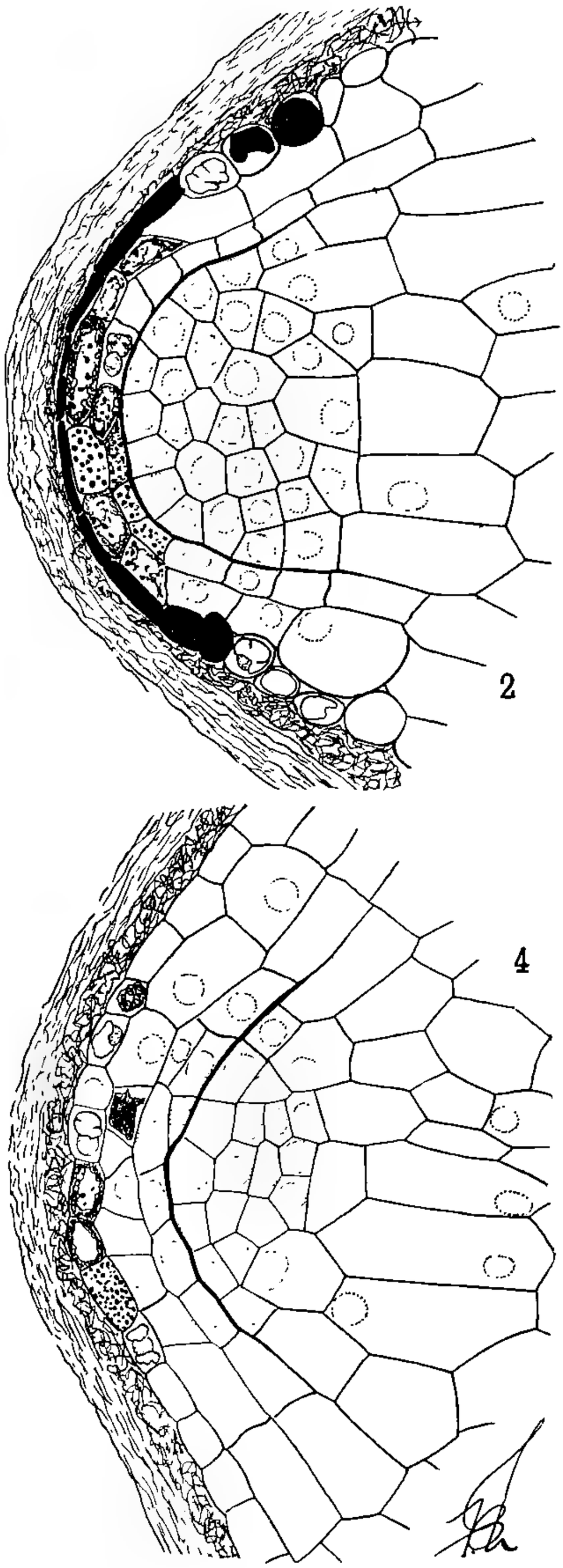
Xanthium, 161, 222, 361
Xanthocephalum, 161
Xanthoceras, 161, 227, 367
Xanthorrhiza, 161, 210, 226, 349, 365
Xanthoxylum, 161, 227, 367

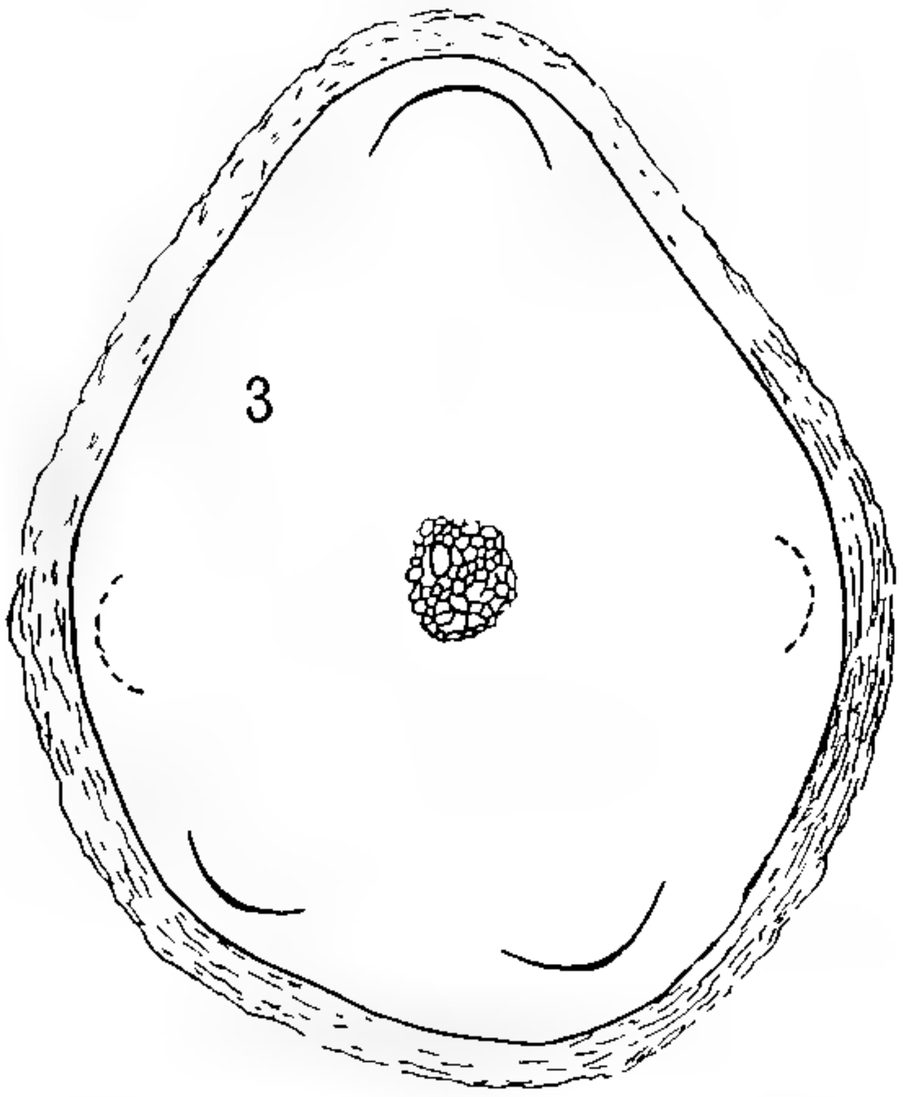
Xeranthemum, 161, 225, 364
Xerophyllum, 344
Xolisma, 161, 235, 376

Yucca, 161, 207, 237, 345, 378

Zacintha, 222
Zamia, 161, 236, 377
Zantedeschia, 378
Zea, 205, 343
Zebrinia, 378
Zelkova, 161, 226, 231, 365, 373
Zephyranthes, 207, 345
Zinnia, 161, 225, 364
Zizia, 161, 218, 355
Zizophora, 161, 357
Zizyphus, 161, 367, 376
Zygadenus, 161, 206, 344
Zygodesmus, 425
Zygopetalum, 161, 238, 380







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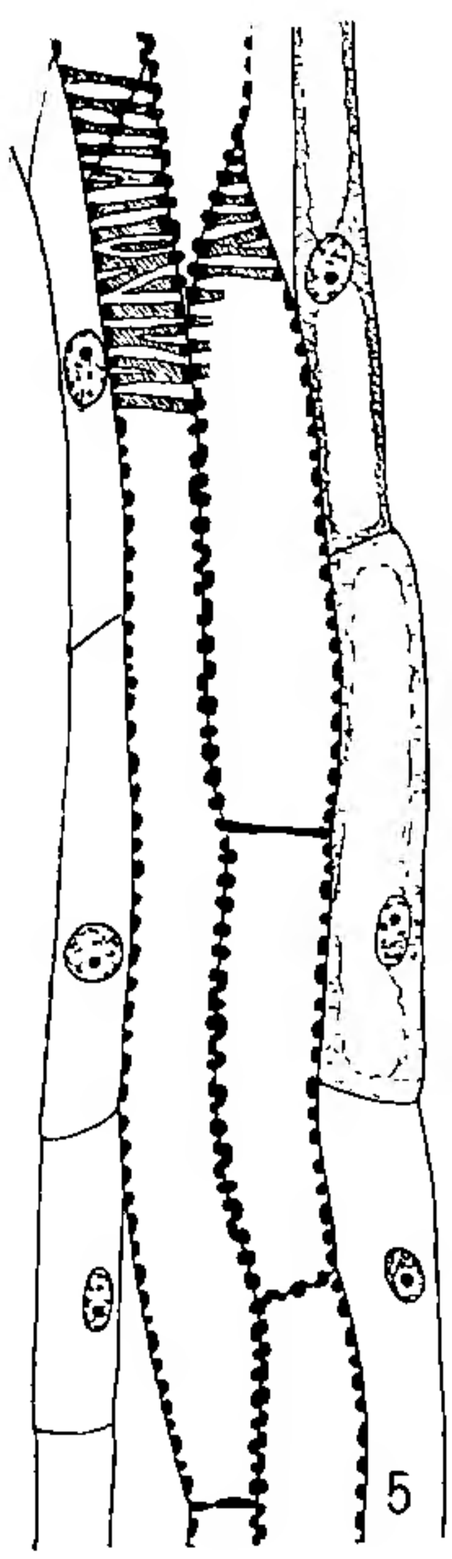

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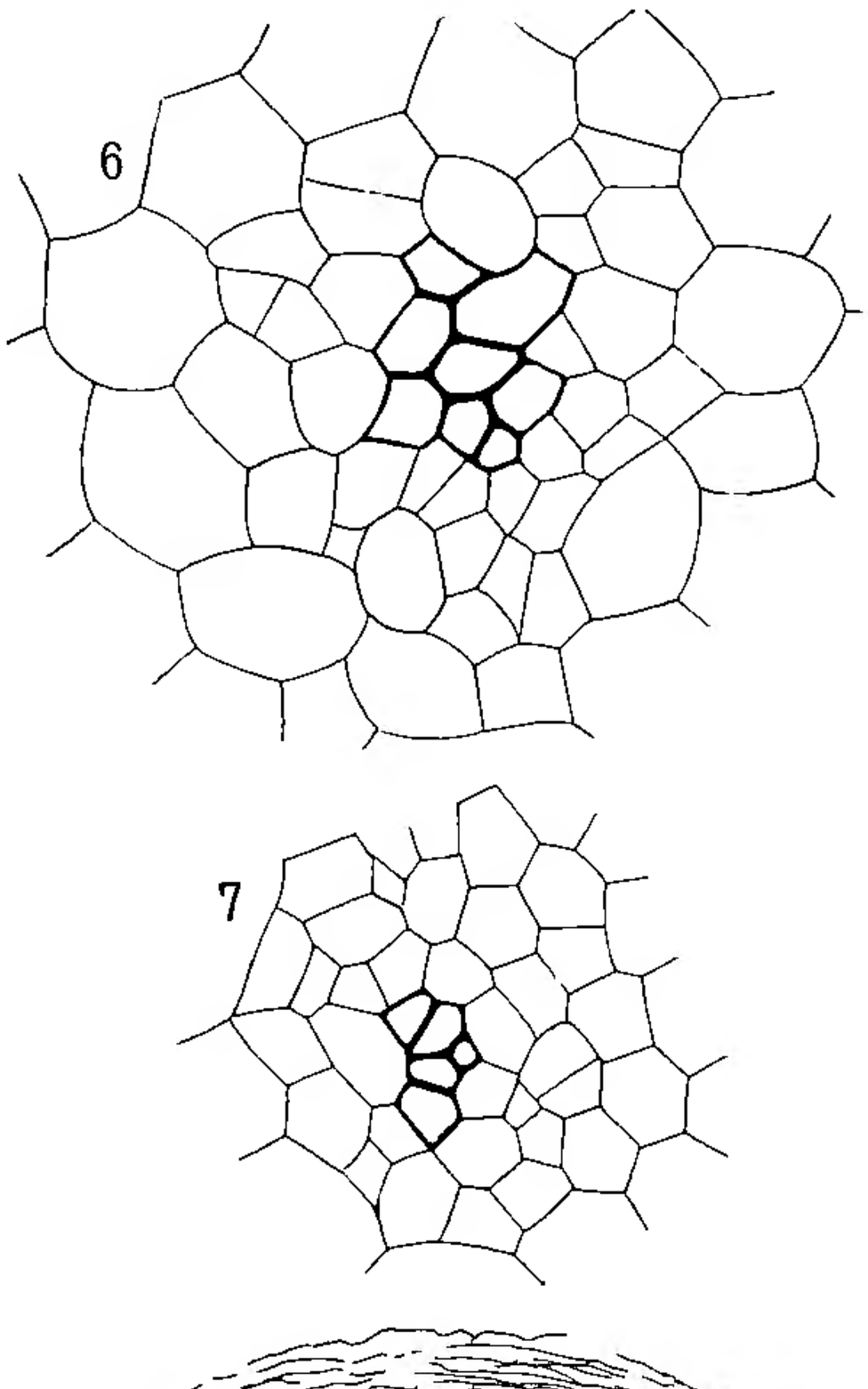

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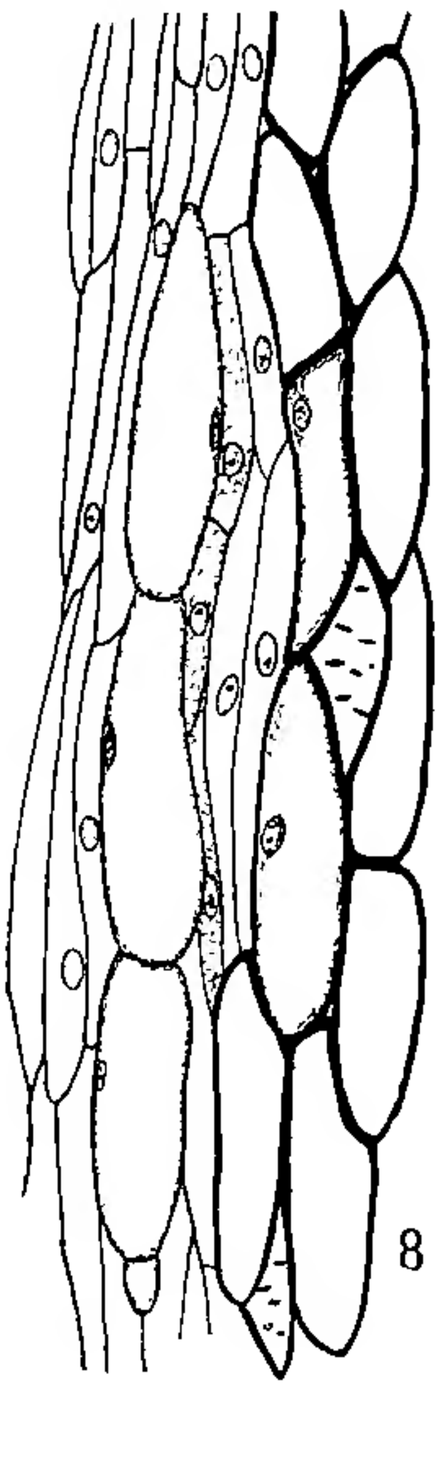

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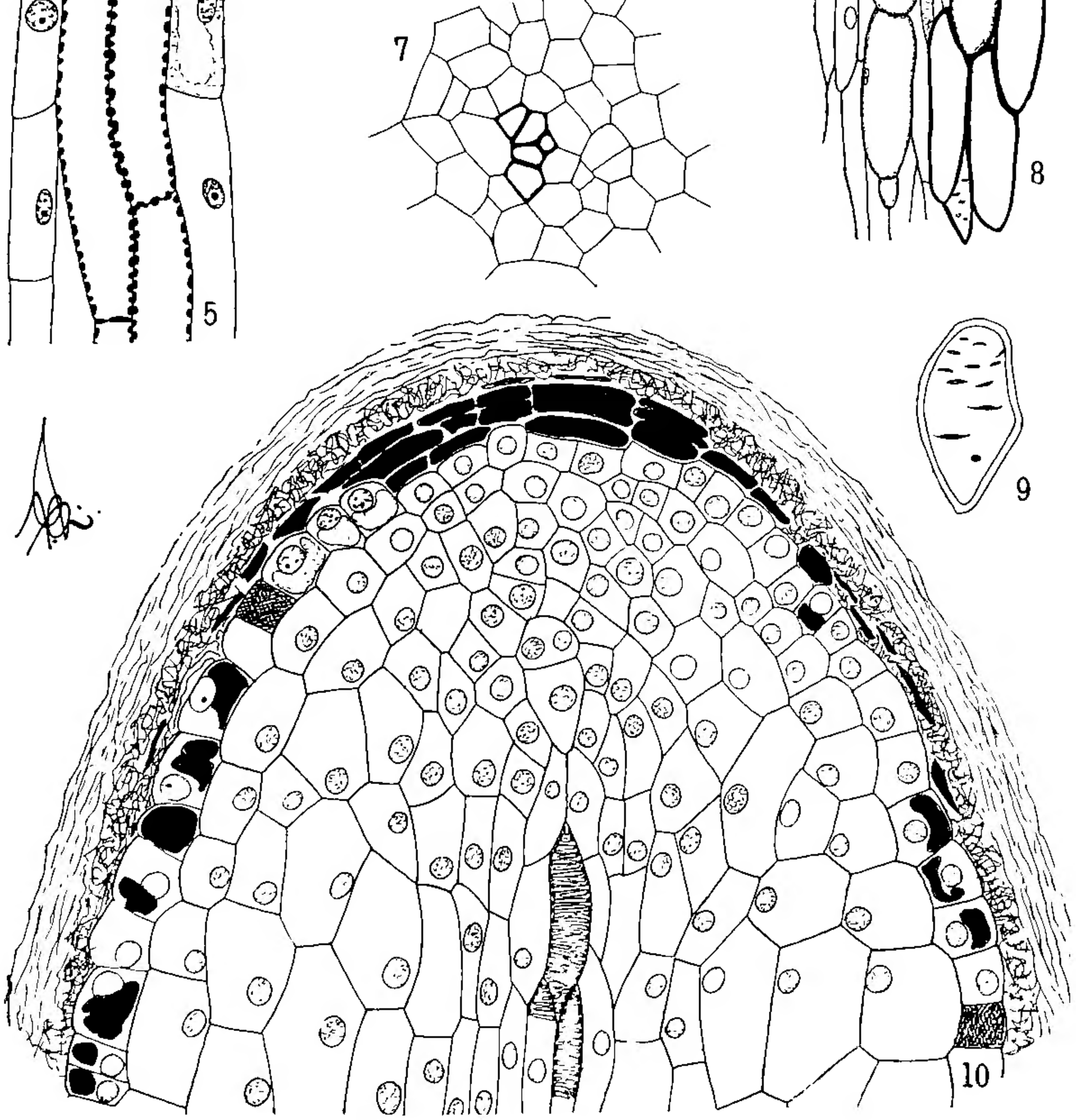

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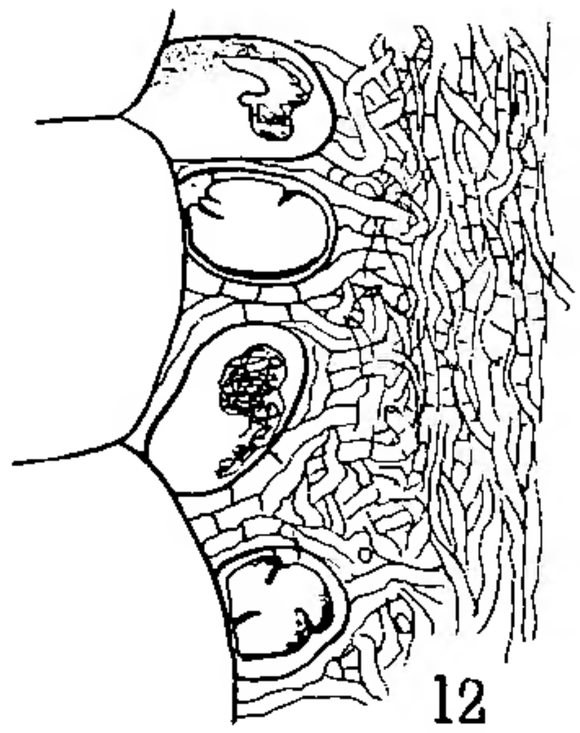

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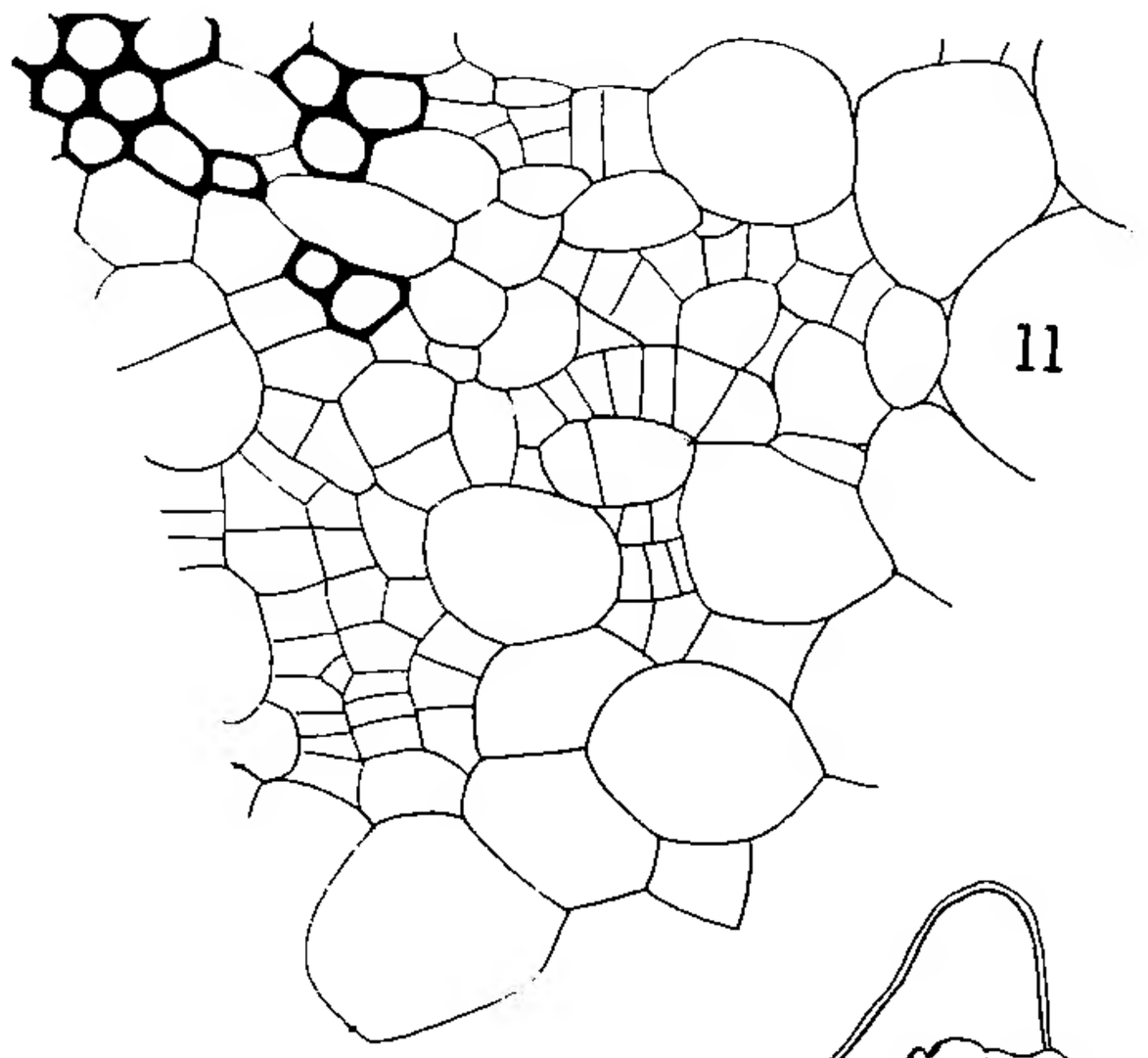

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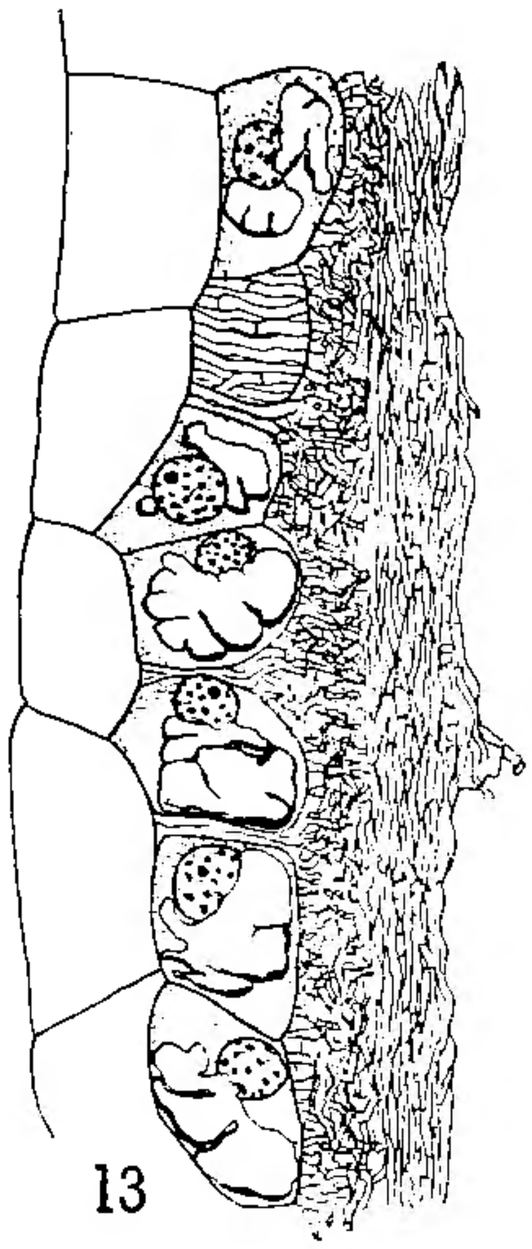

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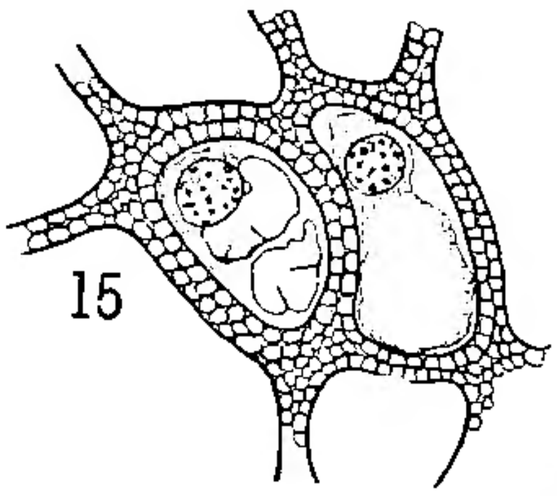

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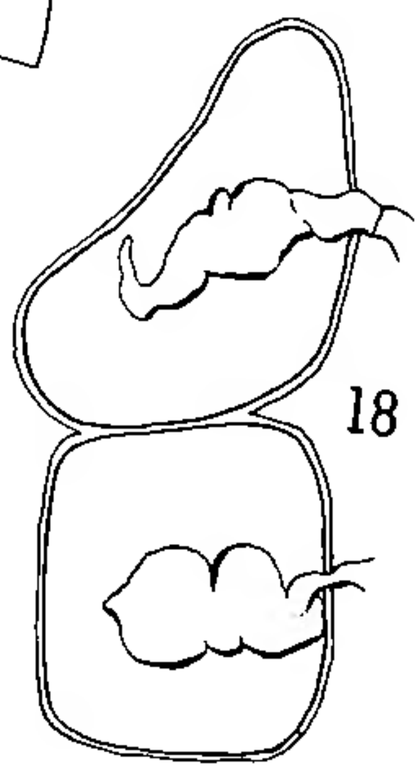

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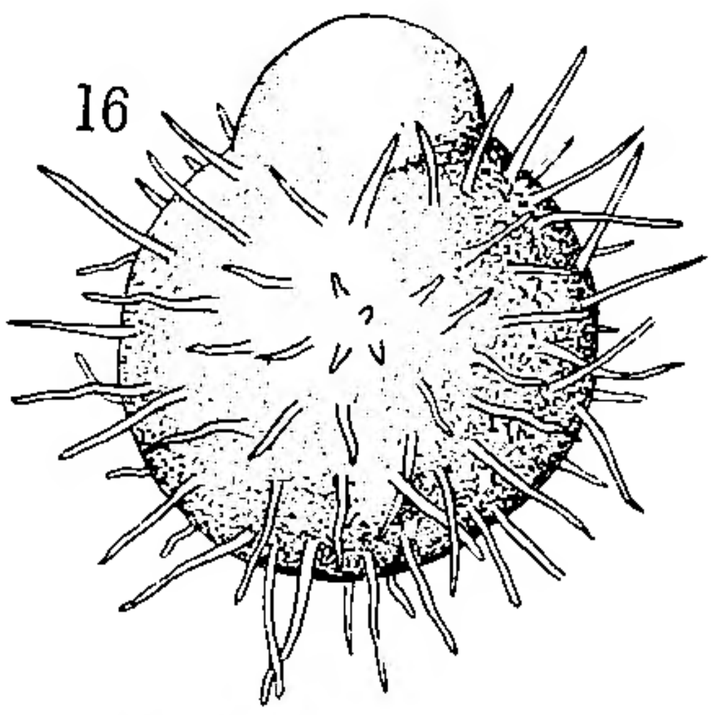

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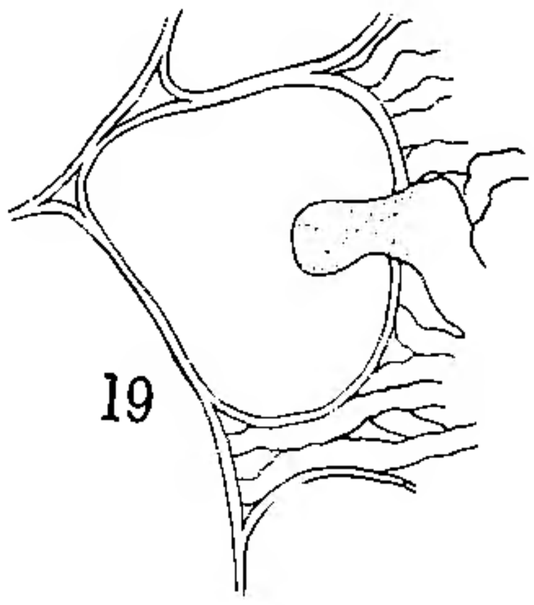

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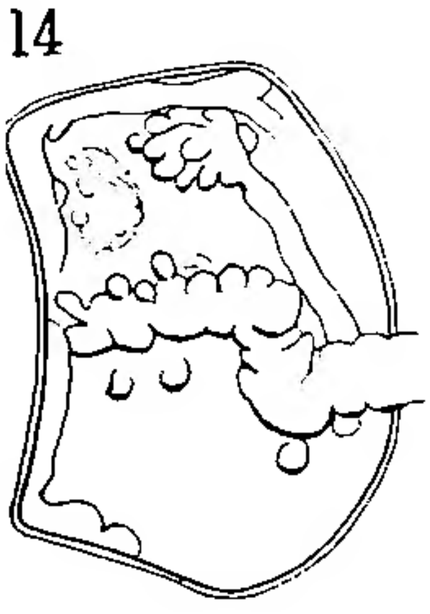

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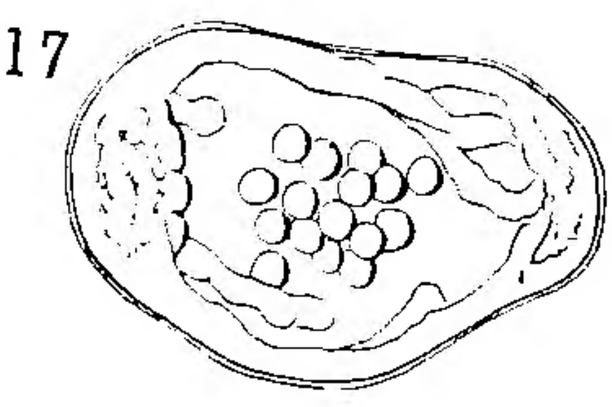

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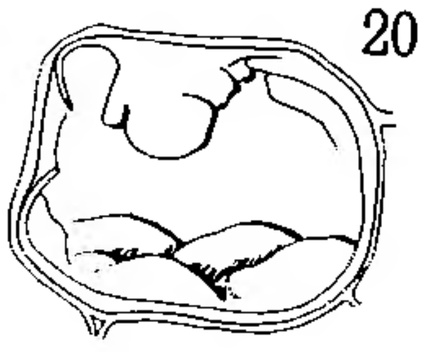

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